BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

STI

Annual Report 2012

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2012

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Preface

Once again, the province of British Columbia has experienced a continued increase in rates of bacterial sexually transmitted infections (STI). While trends are similar to other jurisdictions, bending these curves to a more favorable direction remains a challenge for public health. The basic tenets of STI control include primary and secondary prevention through making well-informed sexual decisions, harm reduction, and access to diagnostics and effective treatments. The ultimate goal is to abate symptoms, reduce complications, and prevent ongoing spread to others for both improved individual and public health.

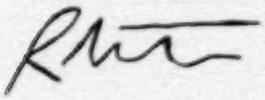
Critical to these approaches are the availability of cost effective education, testing, case detection, treatment and prevention strategies, and tools. One key evidence-based approach for containing the spread of STIs is the testing and treatment of sexual partners which requires considerable coordination between individuals, their care providers and public health. Another strategy is improving low-threshold access to individuals and populations to expert clinical or outreach services. In the recent 'BC Guiding Framework for Public Health', a need for a sexually transmitted infection strategy was identified.

In 2012, *Chlamydia trachomatis*, continued to be the most prevalent reportable STI in the province. Chlamydia is widespread among sexually active individuals of all ages and populations but highest among young women and in Northern communities. Lymphogranuloma venereum (LGV), a particularly virulent form of chlamydia, re-emerged in recent years and primarily presents as proctitis or inguinal adenopathy. *Neisseria gonorrhoeae* rates continue to rise, are most prominent among men, and appear more concentrated in highly sexually active networks. A major threat to gonorrhea control is increasing antimicrobial drug resistance. In 2011, BC adopted new gonorrhea treatment guidelines in conjunction with our national partners at the Public Health Agency of Canada. At least for now, we have been observing a more recent favourable trend in antimicrobial resistance patterns for sexually transmitted gonorrhea infections. Syphilis, on the other hand, has bounced back from a low-point in 2010 and continues a steep upward trend, predominantly among gay, bisexual and other men who have sex with men (MSM) and individuals with HIV infection. Increased vigilance is needed for diagnosing and preventing this sometimes very serious infection.

At BCCDC, we continue to incubate and innovate new approaches to STI prevention and care. These include monitoring of *N. gonorrhoeae* drug susceptibility (in collaboration with the BC Public Health Microbiology Reference Laboratory), centralized management and follow-up of syphilis and LGV cases, and exploration of mobile and online methods to reduce barriers to prevention, care and treatment. As one example of the latter, in 2012 we upgraded our sexual health website, SmartSexResource.com, which now provides online access to nurses, an interactive clinic finder, and up-to-date information for both providers and the populations of British Columbians they serve.

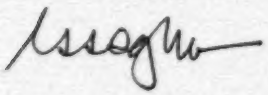
While these are exciting times for advances in HIV and HPV control with expanded treatment and availability of effective vaccines, respectively, extra vigilance will be required to reverse the worrisome trends in bacterial STI rates. This report describes the trends and demography needed to understand our epidemics and to strategize our population and public health responses. It should also provide the basic elements for health care providers to accurately inform their patients of their risks, and guide appropriate interventions and management.

Sincerely,



Dr. Richard Lester, Medical Head, STI/HIV Control

Dr. Mark Gilbert, Epidemiology and Surveillance



Dr. Gina Ogilvie, Medical Director

Clinical Prevention Services, BCCDC

Summary of Trends

Genital Chlamydia

In 2012, the rate of genital chlamydia increased slightly to 267.9 per 100,000 population, continuing an overall increase since 1998.

- The highest rates were in Northwest, Northern Interior and Vancouver Health Service Delivery Areas.
- Females continued to have higher rates of genital chlamydia infection compared to males.
- The highest rates were among young adults (20-24 years for both genders) followed by adolescents (15-19 years) although there has been a levelling off of rates in these age groups in recent years.
- In 2012, there were 77 extra-genital infections identified and 1 perinatally-acquired infection.
- A decrease in lymphogranuloma venereum (LGV) was identified in 2012 although the number of LGV cases remains higher than historic levels. All cases were among men who have sex with men, many of whom are co-infected with HIV.

Genital Gonorrhea

In 2012, the provincial rate of genital gonorrhea decreased slightly to 28.1 per 100,000 population, however, the overall provincial trend has been a steady increase since 1998.

- The highest rates of infection were in Vancouver, Northern Interior and Northwest Health Service Delivery Areas.
- Males have higher rates of infection compared to females and in 2012, rates in males decreased while rates in females have been more stable.
- The highest rates of infection were among both females and males aged 20-29 years.
- In 2012, there were 174 extra-genital infections with majority being throat infections.
- Analysis of recent gonorrhea antimicrobial resistance trends in BC demonstrates a reduction in the proportion of isolates with reduced susceptibility to cefixime and ceftriaxone since 2010 which may in part be due to changes in Canadian and provincial treatment guidelines.

Pelvic Inflammatory Disease and Ectopic Pregnancy

In 2011, the rate of physician billings and hospital admissions for women related to pelvic inflammatory disease was stable or decreased which is consistent with the overall decline in this potential complication of chlamydia or gonorrhea infection over the past two decades. While hospitalizations of women related to ectopic pregnancy have shown a similar trend, the number of physician billings has shown a small but steady increase since 2003 in BC.

Infectious Syphilis

In 2012, the provincial rate of infectious syphilis increased to 8.1 per 100,000 population, continuing a reversal of declining provincial rates first observed in 2011.

- The highest rates of infection were in Vancouver, Richmond and Fraser North Health Service Delivery Areas.
- In 2012, over 90% of cases were male, with highest rates observed in individuals aged between 25-59 years. A small increase in female cases (and maternal syphilis cases) was identified in 2012.
- The majority of cases in 2012 were among people identified as Caucasian (63%).
- Men who have sex with men (MSM) continued to comprise the greatest number of new infectious syphilis cases in BC (84% in 2012). Among MSM cases where HIV status is known, over 65% were co-infected with HIV.
- The provincial rate of infectious syphilis has continued to increase steadily through 2013 with the majority of cases continuing to occur among MSM.

Genital Chlamydia by Region, Gender and Age

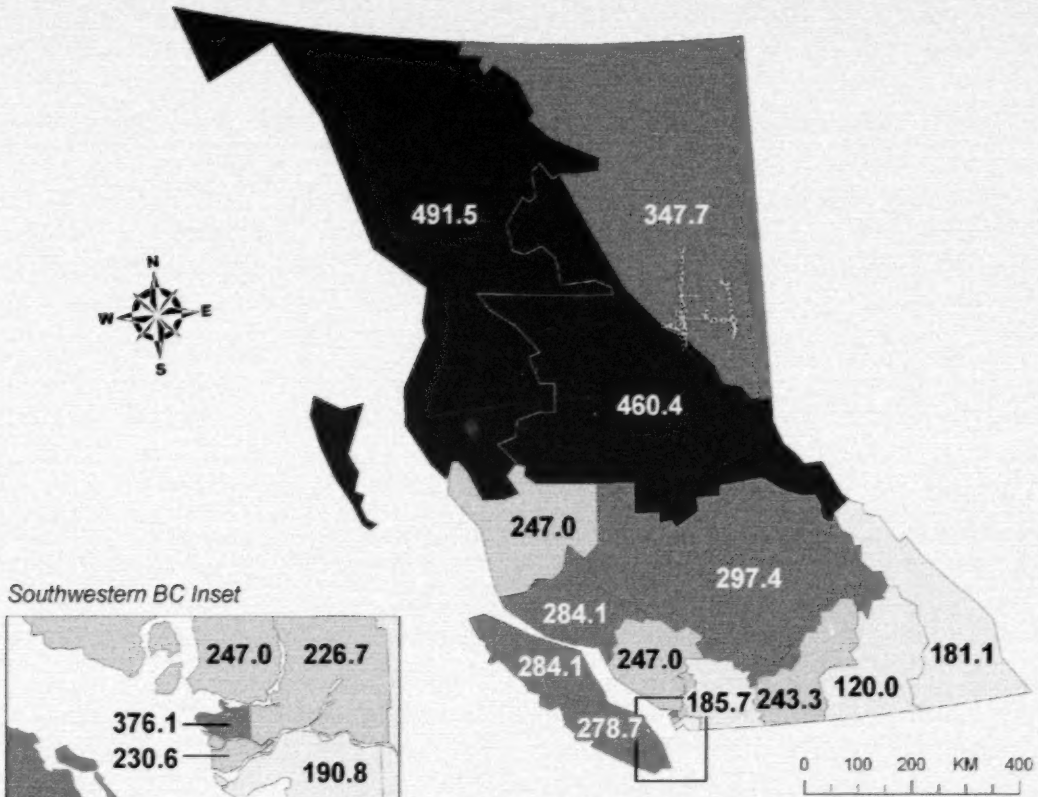
Genital chlamydia is the most commonly reported sexually transmitted infection in BC. As the majority of chlamydia infections are asymptomatic, the reported number of chlamydia infections are only a portion of the total population burden. If untreated, genital chlamydia may lead to complications such as pelvic inflammatory disease (a major cause of infertility, ectopic pregnancy and chronic pain) in women and epididymo-orchitis in men.

Mirroring the national trend, genital chlamydia rates have steadily increased from 1998 to 2012 although these rates have declined for most of the 1990s (Figure 2). In 2012, the rate of genital chlamydia for BC increased to 267.9 (12,364 cases) from 256.8 (11,745 cases) per 100,000 population in 2011. The highest rates of genital chlamydia were in Northern Health Authority (Figure 3). Rates among Health Service Delivery Areas varied with the highest rates in Northwest, Northern Interior and Vancouver, and the lowest rates in Kootenay Boundary, East Kootenay and Fraser East (Figure 1).

Similar increases in chlamydia infections have been observed in high income countries around the world. This increase is related to multiple factors including changes over time in the sensitivity of laboratory tests and uptake (e.g., the greater acceptability of urine-based tests among men) and provider screening practices. This may also be a paradoxical effect of improvements in early screening and treatment for chlamydia over the past decades resulting in individuals being less likely to develop full immunity and consequently more susceptible to re-infection (known as the "arrested immunity" hypothesis[1,2]) – a finding which is supported by decreased rates of complications of chlamydia infection (i.e., pelvic inflammatory disease or ectopic pregnancy) over this time period. While data on population trends in sexual behaviour is not available for BC, it is possible that changes in behaviour may also be contributing to increasing chlamydia incidence.

Females continue to have approximately twice the infection rate compared to males, however, the increase in rates for males in 2012 was greater than the increase in females (Figure 4). Consistent with the data from 2003 to 2011 and influenced primarily by trends among females (Figure 7), in 2012, the highest rates of chlamydia were among young adults aged 20-24 years followed by adolescents aged 15-19 years (Figure 6). For females, the rate for the age group 20-24 years increased while the rate for the age group 15-19 years decreased in 2012. Males aged 20-29 years had the highest chlamydia rates in 2012 (Figure 8). The greater number of infections among females is partially due to routine screening performed at the time of visits that were for other reasons (e.g., pap testing or contraception counselling). The Public Health Agency of Canada currently recommends that all sexually active males and females under the age of 25 years be screened for chlamydia.

1. Genital chlamydia case reports in BC by health service delivery area, 2012



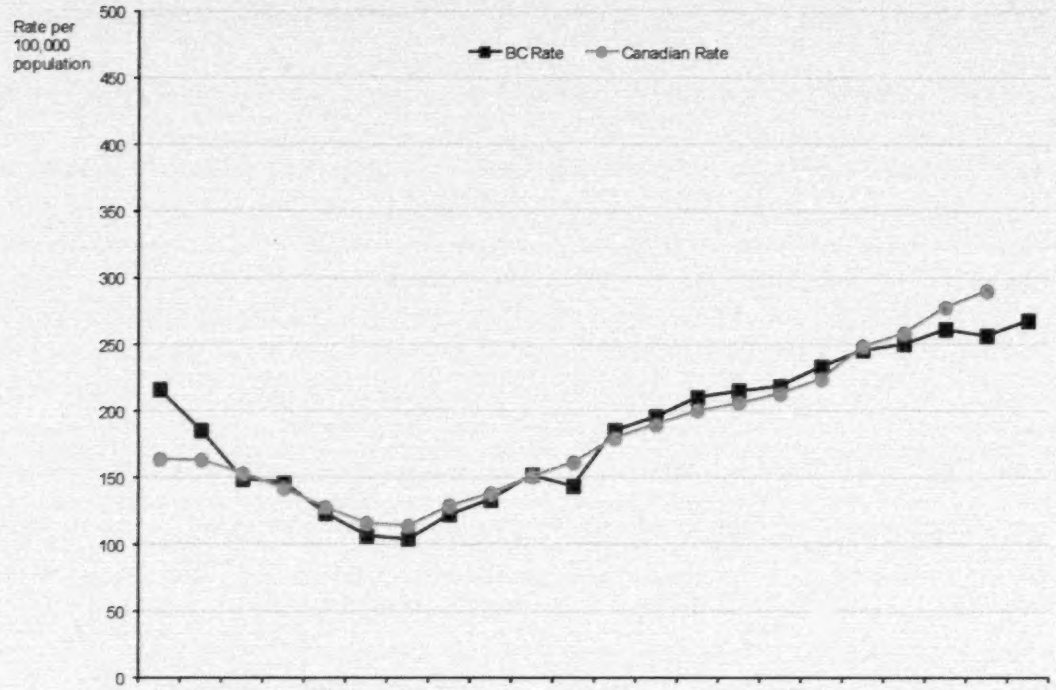
Rate per 100,000 population by HSDA

- 120.0 - 190.8
- 226.7 - 247.0
- 278.7 - 376.1
- 460.4 - 491.5

ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	146	181.1
12	Kootenay Boundary	96	120.0
13	Okanagan	863	243.3
14	Thompson Cariboo Shuswap	667	297.4
21	Fraser East	536	185.7
22	Fraser North	1413	226.7
23	Fraser South	1408	190.8
31	Richmond	461	230.6
32	Vancouver	2575	376.1
33	North Shore/Coast Garibaldi	718	247.0
41	South Vancouver Island	1058	281.1
42	Central Vancouver Island	744	278.7
43	North Vancouver Island	345	284.1
51	Northwest	371	491.5
52	Northern Interior	668	460.4
53	Northeast	251	347.7

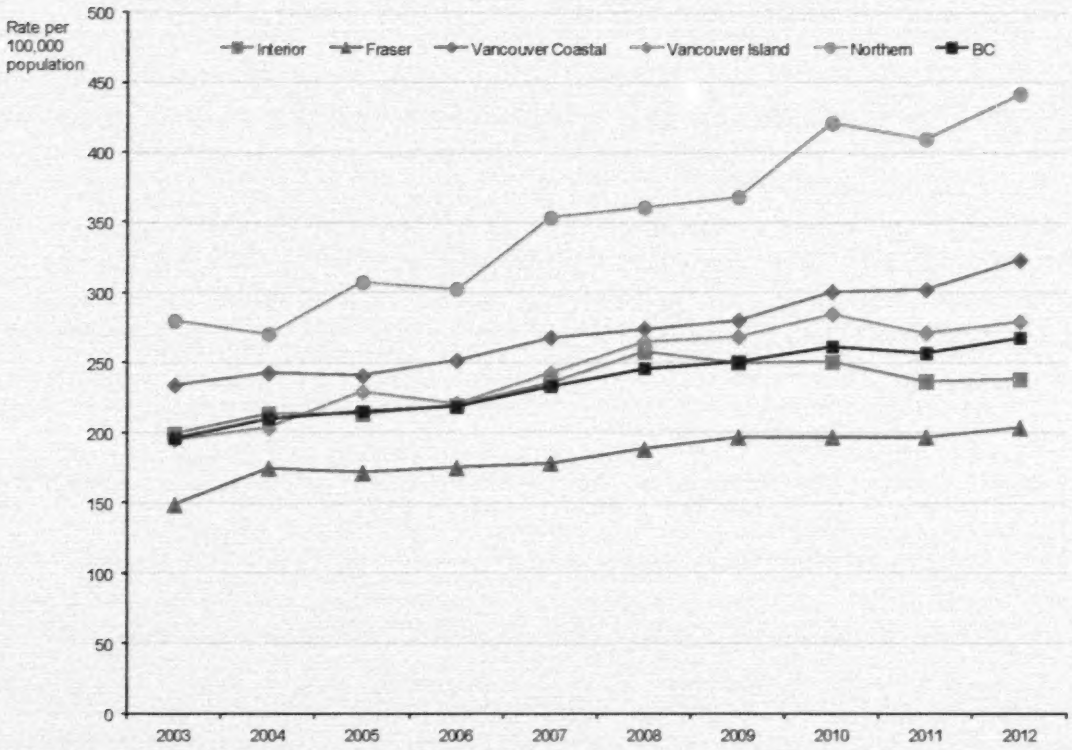
Rates calculated with population estimates released by BC Stats

2. Genital chlamydia case reports in BC and Canada by historical trend, 1991 to 2012*

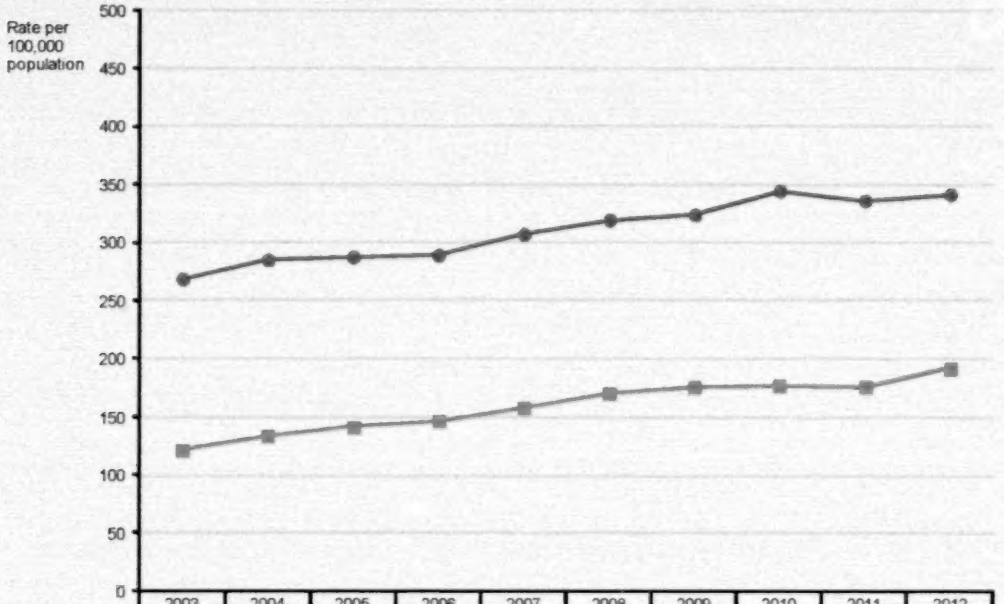


2011 Canadian rate is preliminary and subject to change
*2012 Canadian rate is not available

3. Genital chlamydia case reports in BC by health authority, 2003 to 2012



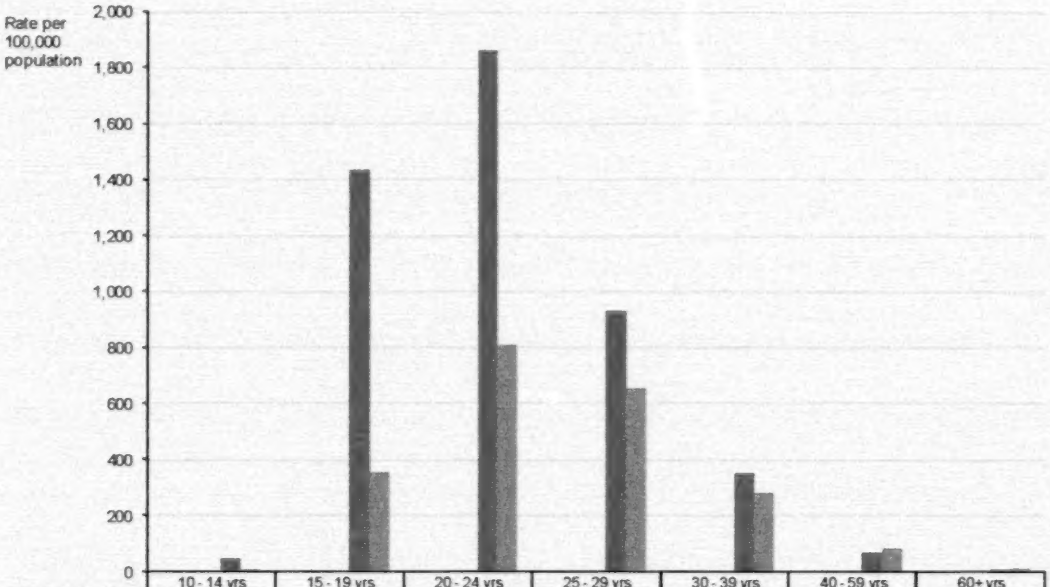
4. Genital chlamydia case reports in BC by gender, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Reports - Female	5,588	5,984	6,094	6,197	6,683	7,065	7,287	7,872	7,761	7,955
Reports - Male	2,485	2,748	2,945	3,071	3,373	3,703	3,881	3,968	3,978	4,399
Reports - Other *	1	1	1	6	4	6	8	5	6	10
Rate - Female	268.8	285.4	287.8	289.4	307.4	319.6	324.2	344.8	336.5	341.7
Rate - Male	121.6	133.5	141.6	146.1	157.9	170.4	175.5	176.6	175.5	192.3

*Other - transgender and gender unknown

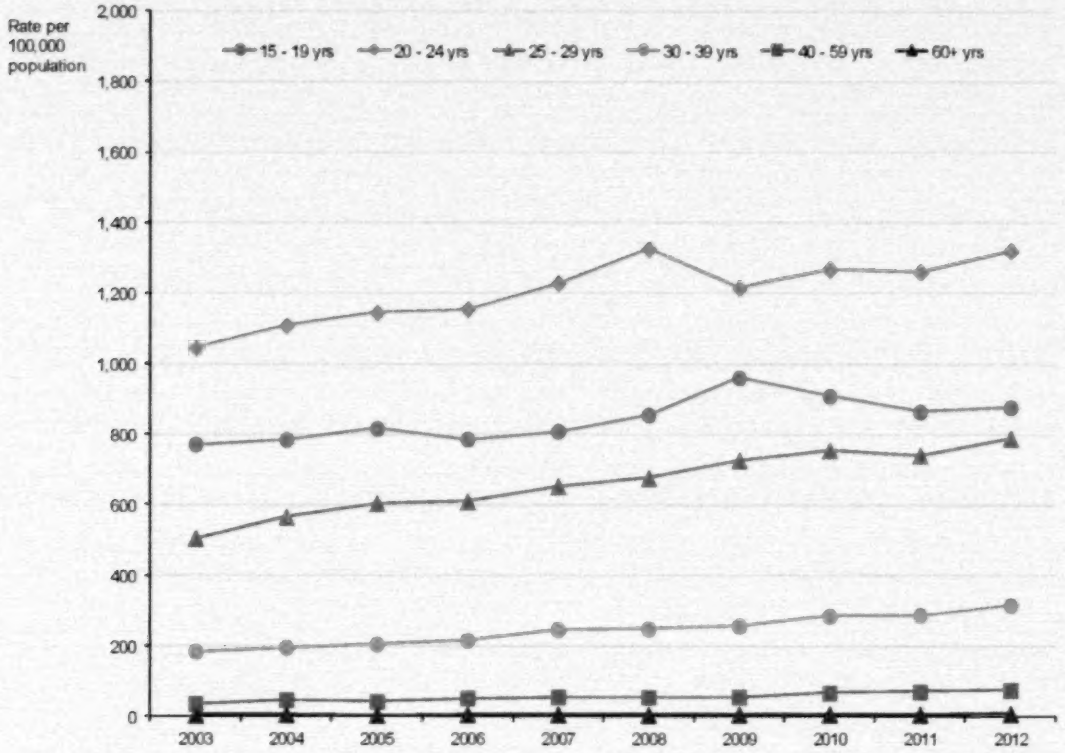
5. Genital chlamydia case reports in BC by age group and gender, 2012



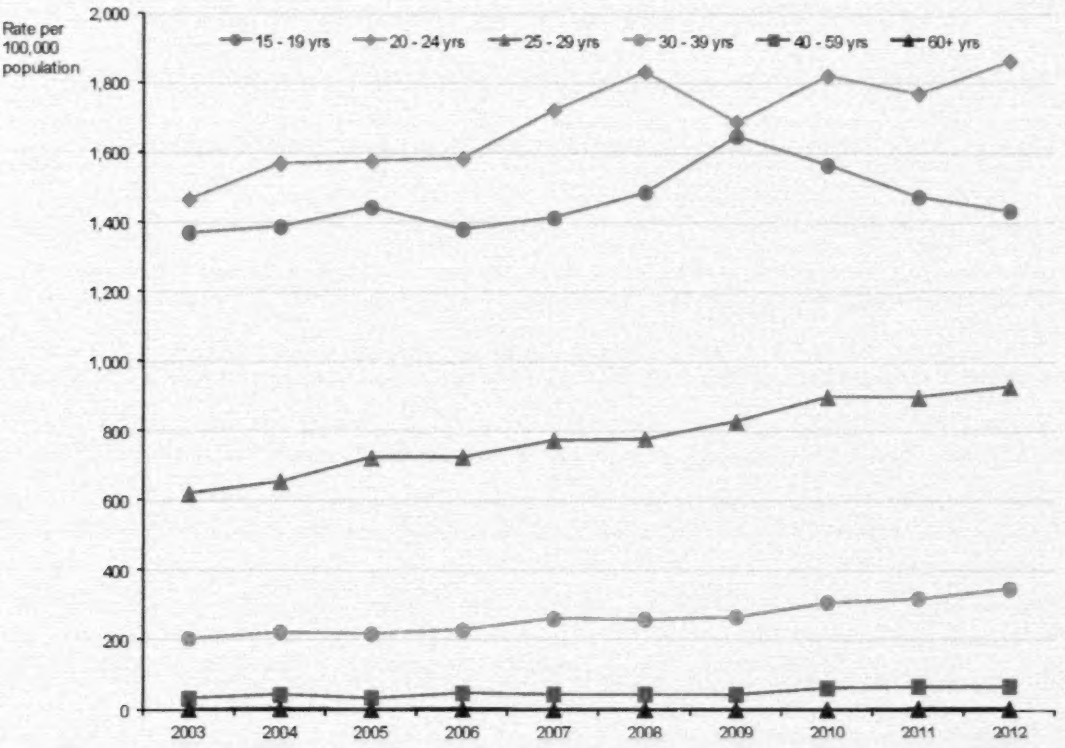
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	51	1,888	2,949	1,506	1,065	474	19
Reports - Male	6	493	1,374	1,098	834	540	52
Reports - Other *	0	1	3	3	2	1	0
Rate - Female	45.1	1,433.0	1,863.3	928.6	347.4	68.2	3.5
Rate - Male	5.0	351.9	810.8	653.0	280.1	79.7	10.8

*Other - transgender and gender unknown

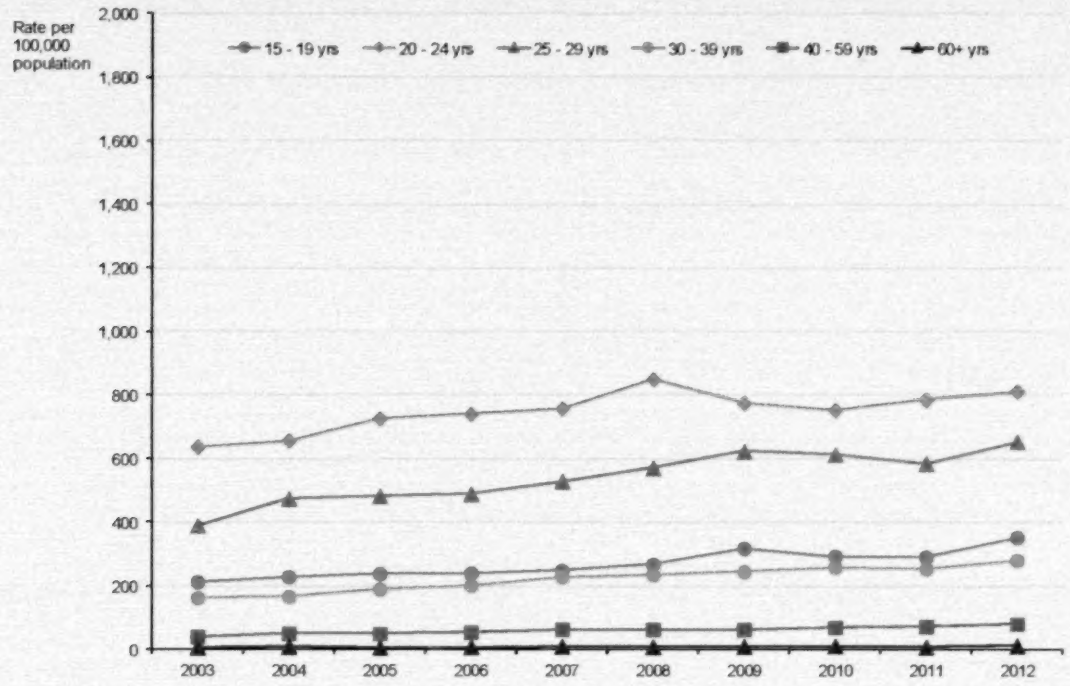
6. Genital chlamydia case reports in BC by age group - total, 2003 to 2012



7. Genital chlamydia case reports in BC by age group - female, 2003 to 2012



8. Genital chlamydia case reports in BC by age group - male, 2003 to 2012



Extra-genital Chlamydia

Up until 2011, a small number of extra-genital chlamydia infections have been diagnosed each year in BC. In 2012, 77 extra-genital cases were identified (15 females, 60 males) which is an increase from 26 cases in 2011 (10 females and 16 males). This is primarily due to an increase in the number of throat infections resulting from a pilot project of throat screening among clients at BCCDC sexually transmitted infection clinics in 2012. From 2003 to 2012, 262 infections were identified in specimens collected from the following sites: throat (85 cases, 32.4%), eye (102 cases, 38.9%), lung (1 case, 0.4%), and other sites (74 cases, 28.2%) (Figure 9). As screening for chlamydia infections at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices.

9. Extra-genital chlamydia case reports in BC by site/culture, 2003 to 2012

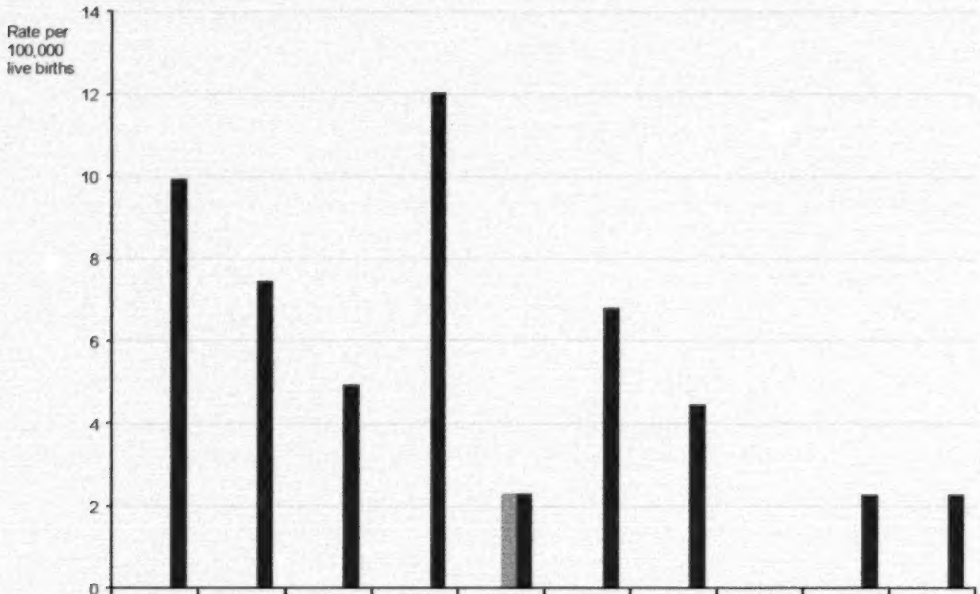
Gender	Site	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Female	Throat	0	0	0	1	2	0	0	0	0	5
	Eye	6	5	9	6	3	3	6	3	3	2
	Lung	0	0	0	0	0	0	0	0	0	0
	Other	0	0	0	0	1	7	10	10	7	8
	Total	6	5	9	7	6	10	16	13	10	15
Male	Throat	0	0	4	4	1	6	2	6	1	52
	Eye	3	12	5	8	5	5	5	5	5	3
	Lung	0	0	0	0	1	0	0	0	0	0
	Other	0	0	0	0	1	4	0	10	10	5
	Total	3	12	9	12	8	15	7	21	16	60
BC	Throat	0	0	4	5	3	6	2	6	1	58
	Eye	9	17	14	14	8	8	11	8	8	5
	Lung	0	0	0	0	1	0	0	0	0	0
	Other	0	0	0	0	2	11	10	20	17	14
	Total	9	17	18	19	14	25	23	34	26	77

Total reports for BC is the sum of the following genders: female, male, transgender and gender unknown

Perinatally-acquired Chlamydia

Genital chlamydia can be passed by pregnant women to their infants during delivery which can lead to opthalmia neonatorum and pneumonia. One case of perinatally-acquired chlamydia infection was found in a conjunctival specimen in 2012. From 2003 to 2012, the majority of perinatal cases are from conjunctival specimens (22/23 cases, 95.7%) while one case (4.3%) was identified in a respiratory specimen (Figure 10). Current standards of screening and treatment of chlamydia infection for pregnant women in BC and prophylaxis of newborns to prevent complications have most likely resulted in the low rates of perinatally-acquired chlamydia.

10. Perinatally-acquired chlamydia case reports in BC by site, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Reports - Respiratory	0	0	0	0	1	0	0	0	0	0
Reports - Conjunctival	4	3	2	5	1	3	2	0	1	1
Rate - Respiratory	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0
Rate - Conjunctival	9.9	7.4	4.9	12.0	2.3	6.8	4.5	0.0	2.3	2.3

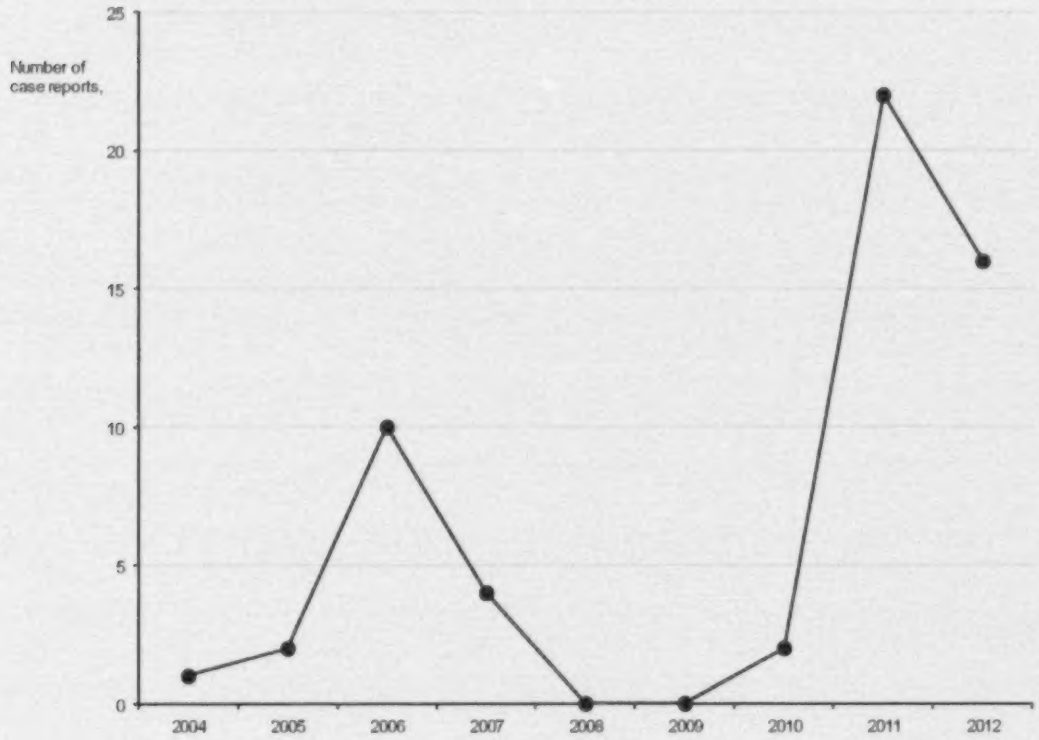
Lymphogranuloma Venereum

Lymphogranuloma venereum (LGV) is a sexually transmitted infection caused by *C. trachomatis* serotypes L1, L2 and L3. The clinical presentation of LGV includes genital papules, ulcers, inguinal lymphadenopathy, and hemorrhagic proctitis. If left untreated, LGV can cause serious sequelae such as lymphatic obstruction or anogenital ulcerations. LGV can easily be misdiagnosed as other sexually transmitted infections or gastrointestinal disease.

LGV emerged in Canada in 2003, with the first reported case in BC in 2004. With increasing cases among gay, bisexual and other men who have sex with men (MSM) in Europe and the US, provincial LGV surveillance commenced in 2004. Occurring in tandem with reports of increased transmission in Europe and the US[3], an increase of LGV cases was observed in 2011 in BC in part related to routine testing of rectal chlamydia specimens for LGV and augmented case-finding. In 2012, 16 LGV cases were identified, a decrease from 2011 (22 cases) but still elevated in comparison to historic trends (Figure 11).

From 2004 to 2012, 57 cases of LGV (45 confirmed, 12 probable) were reported in BC (Figure 11). Most cases (54 cases, 94.7%) were among MSM and most were either diagnosed in Vancouver or southern Vancouver Island. Of those with known HIV status, 73.5% (36/49 cases) were co-infected with HIV. Many cases (30/38 cases, 78.9%) presented with symptoms of proctitis. In 2012, the male rate of LGV in BC was 0.7 (15 cases) per 100,000 population and the average age was 46 years (range 20-68 years). The majority of cases in 2012 were among men identified as Caucasian (11 cases, 73.3%).

11. Lymphogranuloma venereum case reports in BC, 2004 to 2012



Gonorrhea

Genital Gonorrhea by Region, Gender and Age

Gonorrhea infections may be asymptomatic or the symptoms may be mild and as a result, the reports of diagnosed infections may be a portion of the total population burden. As with chlamydia, genital gonorrhea if untreated can lead to pelvic inflammatory disease (and associated complications) in females and epididymo-orchitis in males. While infected with gonorrhea, an individual is also at increased risk of acquiring HIV.

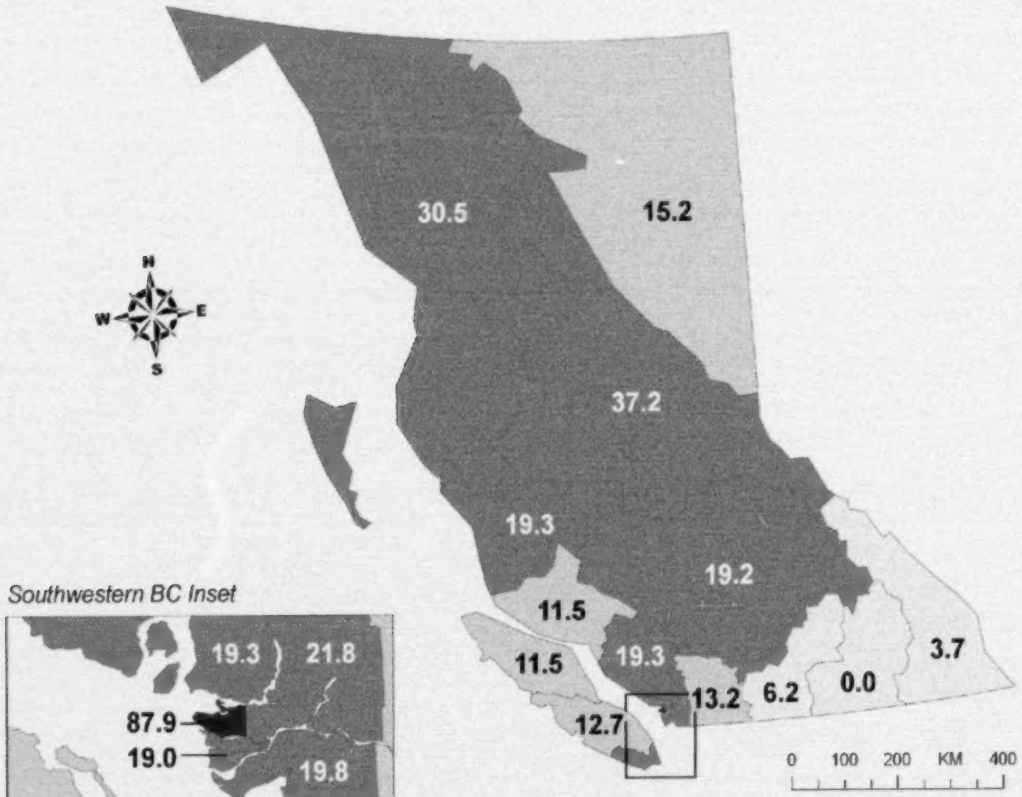
Overall since 1998, the provincial genital gonorrhea rate in BC has increased consistent with national rates (Figure 13). The genital gonorrhea rate in BC decreased to 28.1 (1,295 cases) in 2012 from 34.4 (1,574 cases) per 100,000 population in 2011. The highest rates were in Vancouver Coastal and Northern Health Authorities (Figure 14). Rates among Health Service Delivery Areas vary with the highest rates in Vancouver, Northern Interior and Northwest, and the lowest rates in Kootenay Boundary, East Kootenay and Okanagan (Figure 12). The increase in gonorrhea rates over time is likely related to multiple factors including changes in laboratory testing and screening practices (e.g., routine inclusion of gonorrhea with chlamydia urine nucleic acid testing and increased acceptability of urine-based testing among men over time). It is also possible that changes in behaviour may be contributing to a true increase in incidence during this time period.

Males continue to have a rate two times greater than females (Figure 15). Since 2004, male gonorrhea rates have been relatively stable. In 2012, the rate among males decreased to 36.9 (843 cases) from 49.0 (1,112 cases) per 100,000 population in 2011. Current female gonorrhea rates are relatively stable. The rate among females decreased slightly in 2012 to 19.3 (449 cases) from 19.9 (459 cases) per 100,000 population in 2011.

Similar to trends from 2003 to 2011, in 2012, the highest rates of gonorrhea were among those aged 20-29 years (Figure 17). In 2012, the highest rates among males were in those aged 25-29 years (183 cases, 108.8 per 100,000 population) and among females in those aged 20-24 years (131 cases, 82.8 per 100,000 population) (Figure 19).

Gonorrhea is more likely to be concentrated in sexually active networks and it is likely that in part the reason for higher rates of gonorrhea in males is due to higher rates of gonorrhea among gay, bisexual and other men who have sex with men (MSM). While provincial surveillance data does not permit identification of MSM cases, this has been observed in other jurisdictions.

12. Genital gonorrhea case reports in BC by health service delivery area, 2012



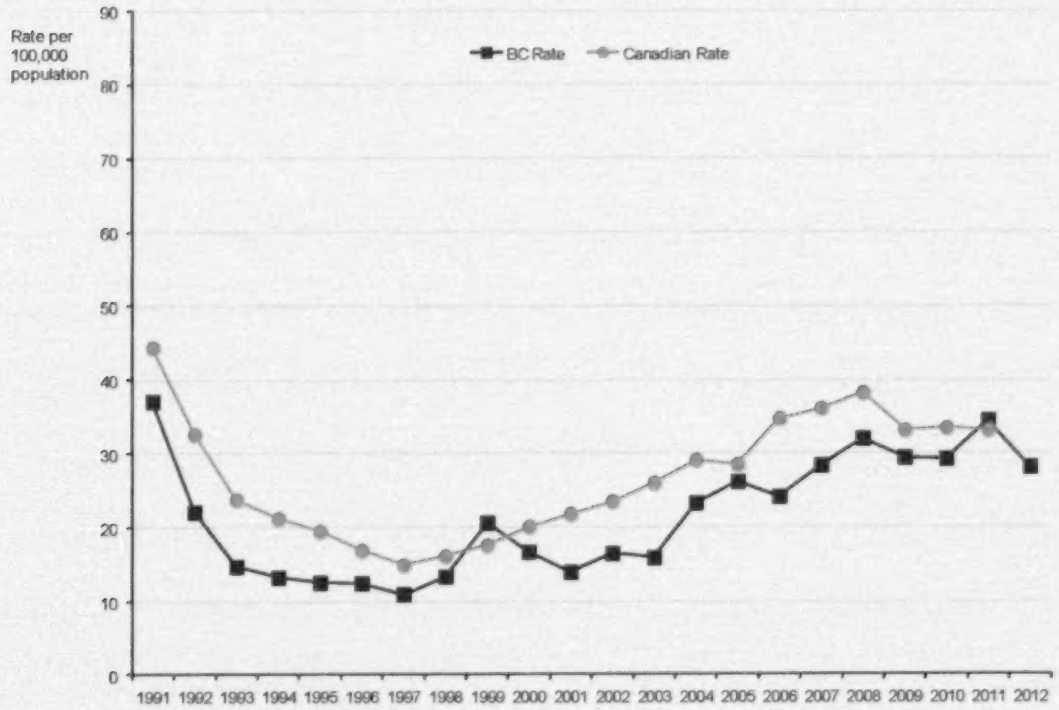
Rate per 100,000 population by HSDA

- 0.0 - 6.2
- 11.5 - 15.2
- 19.0 - 37.2
- 87.9

ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	3	3.7
12	Kootenay Boundary	0	0.0
13	Okanagan	22	6.2
14	Thompson Cariboo Shuswap	43	19.2
21	Fraser East	38	13.2
22	Fraser North	136	21.8
23	Fraser South	146	19.8
31	Richmond	38	19.0
32	Vancouver	602	87.9
33	North Shore/Coast Garibaldi	56	19.3
41	South Vancouver Island	73	19.4
42	Central Vancouver Island	34	12.7
43	North Vancouver Island	14	11.5
51	Northwest	23	30.5
52	Northern Interior	54	37.2
53	Northeast	11	15.2

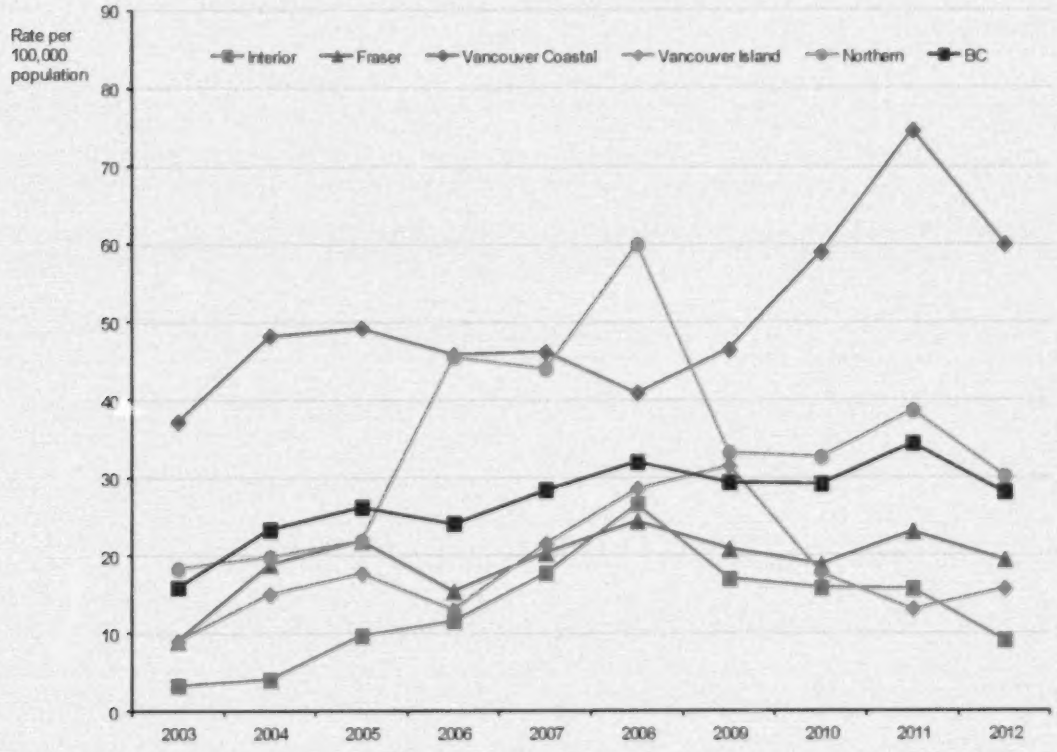
Rates calculated with population estimates released by BC Stats

13. Genital gonorrhea case reports in BC and Canada by historical trend, 1991 to 2012*

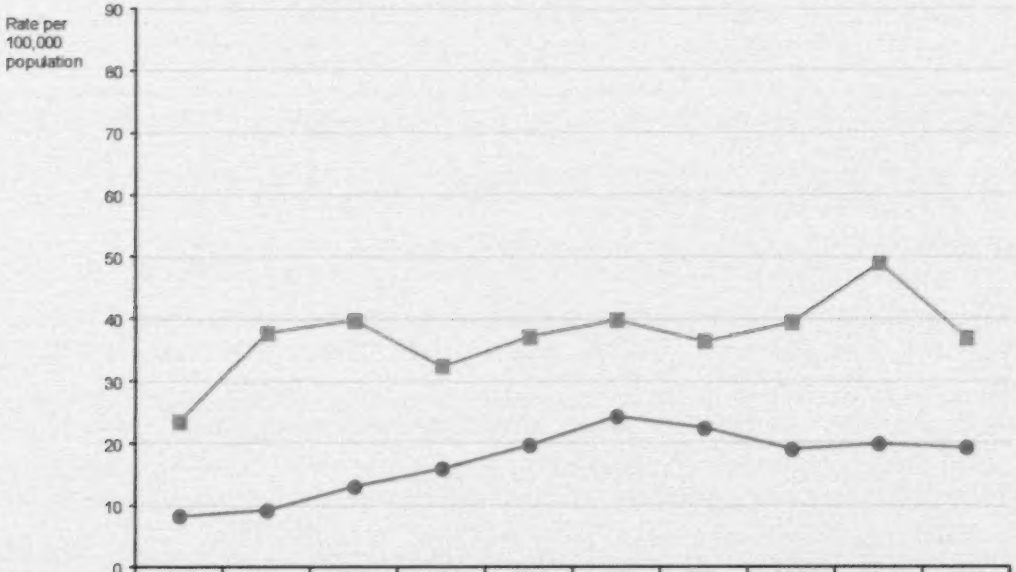


2011 Canadian rate is preliminary and subject to change
*2012 Canadian rate is not available

14. Genital gonorrhea case reports in BC by health authority, 2003 to 2012



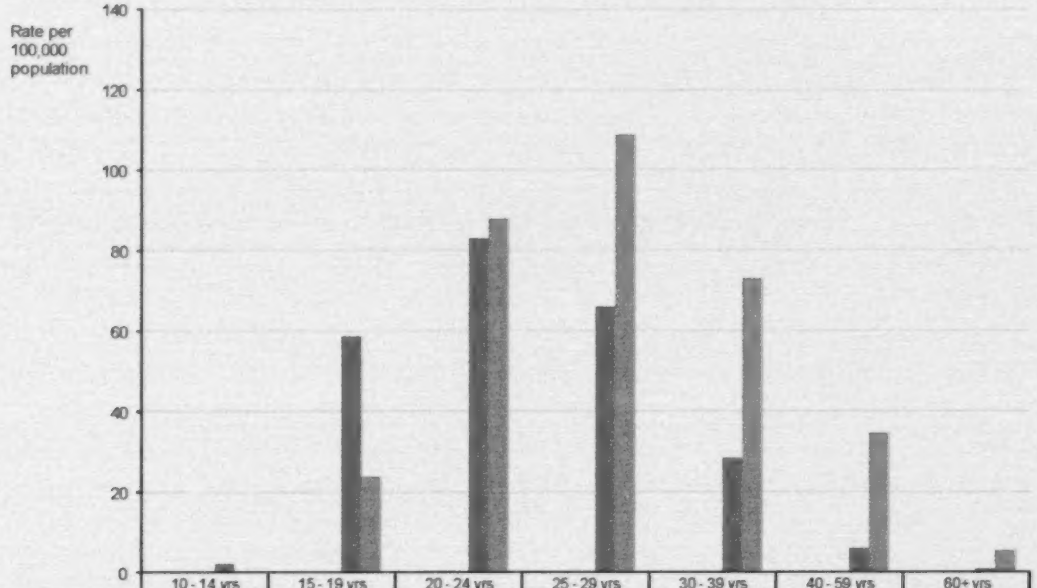
15. Genital gonorrhea case reports in BC by gender, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Reports - Female	172	192	275	340	429	537	503	434	459	449
Reports - Male	481	776	825	681	793	866	805	884	1,112	843
Reports - Other *	1	1	0	1	2	2	1	3	3	3
Rate - Female	8.3	9.2	13.0	15.9	19.7	24.3	22.4	19.0	19.9	19.3
Rate - Male	23.5	37.7	39.7	32.4	37.1	39.8	36.4	39.4	49.0	36.9

* Other - transgender and gender unknown

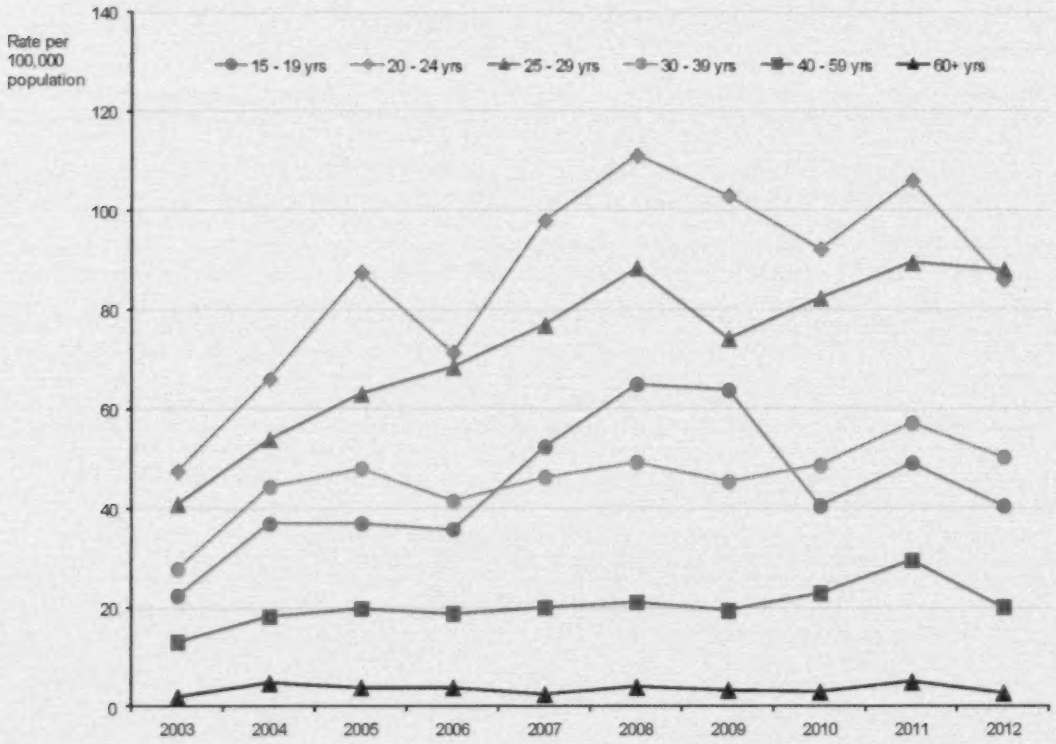
16. Genital gonorrhea case reports in BC by age group and gender, 2012



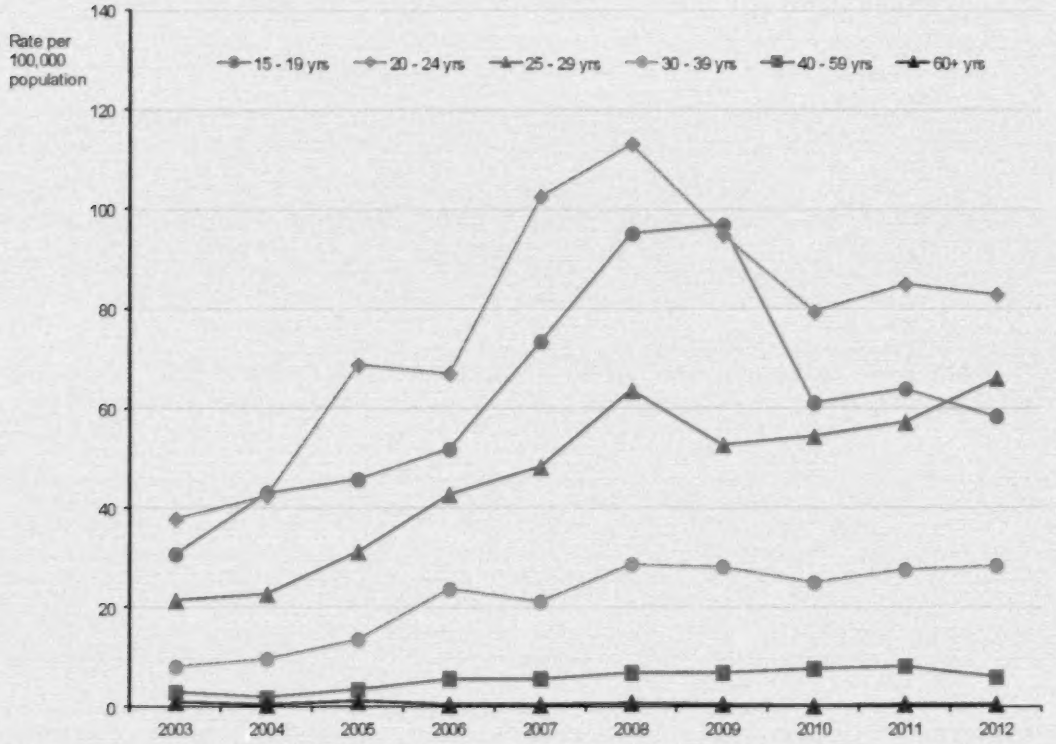
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	2	77	131	107	87	42	3
Reports - Male	0	33	149	183	217	234	26
Reports - Other *	0	0	2	1	0	0	0
Rate - Female	1.8	58.4	82.8	66.0	28.4	6.0	0.6
Rate - Male	0.0	23.6	87.9	108.8	72.9	34.5	5.4

* Other - transgender and gender unknown

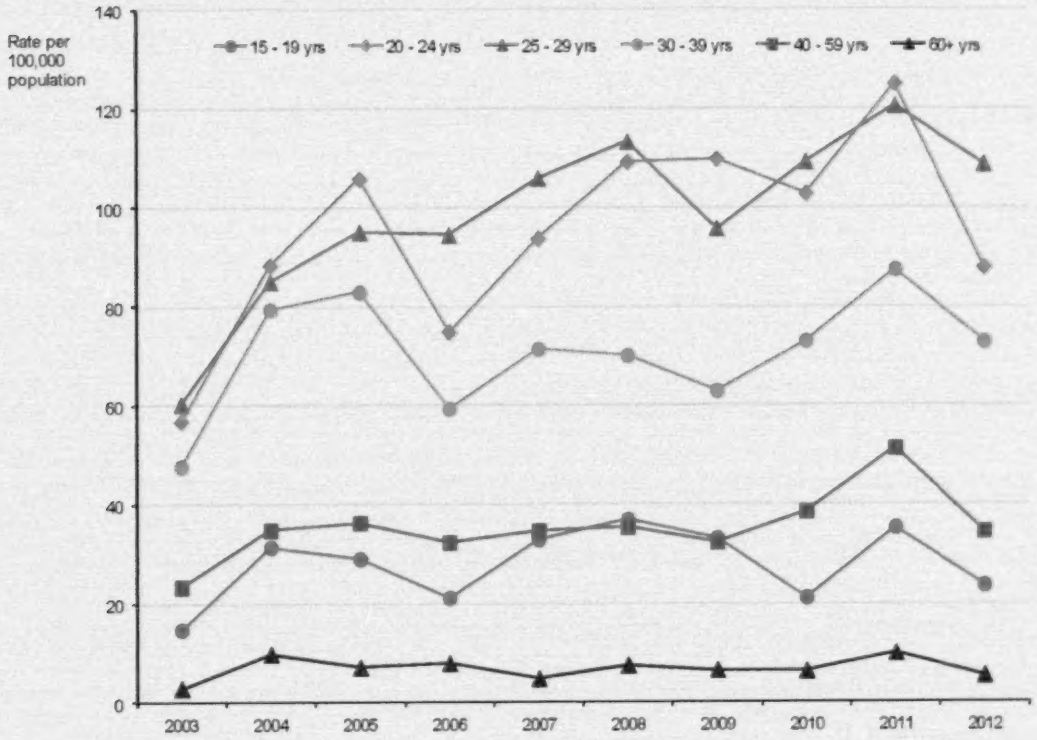
17. Genital gonorrhea case reports in BC by age group - total, 2003 to 2012



18. Genital gonorrhea case reports in BC by age group - female, 2003 to 2012



19. Genital gonorrhea case reports in BC by age group - male, 2003 to 2012



Extra-genital Gonorrhea

Within BC, a small number of extra-genital gonorrhea infections are diagnosed each year. In 2012, 174 cases were identified (11 females, 161 males) which was an increase from 115 cases (13 females, 102 males) in 2011. This is primarily due to an increase in the number of throat infections resulting from a pilot project of throat screening among clients at BCCDC sexually transmitted infection clinics in 2012. Of the 815 cases diagnosed from 2003 to 2012, cases were identified in the throat (723, 88.7%), eye (15, 1.8%), and other sites (68, 8.3%). A small number of the diagnosed cases represented disseminated gonococcal infection (9, 1.1%) (Figure 20). As screening for gonorrhea at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices.

20. Extra-genital gonorrhea case reports in BC by site/culture, 2003 to 2012

Gender	Site	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Female	Throat	6	1	14	16	15	3	7	8	12	8
	Eye	0	1	0	0	1	1	0	1	0	0
	Other	2	3	3	3	5	1	0	2	1	2
	DGI *	0	1	2	0	0	1	0	0	0	1
	Total	8	6	19	19	21	6	7	11	13	11
Male	Throat	27	54	74	41	46	41	43	55	93	156
	Eye	1	0	1	0	1	1	4	2	0	1
	Other	1	1	10	4	0	2	5	10	9	3
	DGI *	1	0	0	0	0	1	1	0	0	1
	Total	30	55	85	45	47	45	53	67	102	161
BC	Throat	33	55	88	57	61	44	52	63	105	165
	Eye	1	1	1	0	2	2	4	3	0	1
	Other	3	4	13	7	5	3	5	12	10	6
	DGI *	1	1	2	0	0	2	1	0	0	2
	Total	38	61	104	64	68	51	62	78	115	174

* DGI - disseminated gnococcal infection

Total reports for BC is the sum of the following genders: female, male, transgender and gender unknown

Perinatally-acquired Gonorrhea

In 2012, there were no reports of perinatally-acquired gonorrhea. One perinatal case has been identified between 2003 and 2011.

Gonorrhea Antimicrobial Resistance

Treatment of gonorrhea has long been challenged by the bacterium's ability to acquire resistance to multiple classes of antibiotics. Historically effective drugs – penicillin, doxycycline and ciprofloxacin – have been successively removed from treatment guidelines, leaving few remaining options. Canadian treatment guidelines currently recommend third-generation cephalosporins for the treatment of gonorrhea: injectable ceftriaxone (250mg) or oral cefixime (800mg), co-treated with 1g of azithromycin.[4] Recent international surveillance data and case reports, however, suggest that susceptibility of gonorrhea to these current first-line treatments is also now threatened. In this context, local surveillance is critical.

The BC Public Health Microbiology Reference Laboratory (BCPHMRL) located at BCCDC routinely tests *N. gonorrhoeae* isolates for susceptibility to a panel of antimicrobial drugs, including cefixime, ceftriaxone and azithromycin. Data presented here summarize the minimum inhibitory concentration (MIC) of these drugs among isolates from BC. The MIC represents the lowest amount of drug required to inhibit growth of the bacterium; a higher MIC thus suggests that the bacterium is less susceptible to the drug.

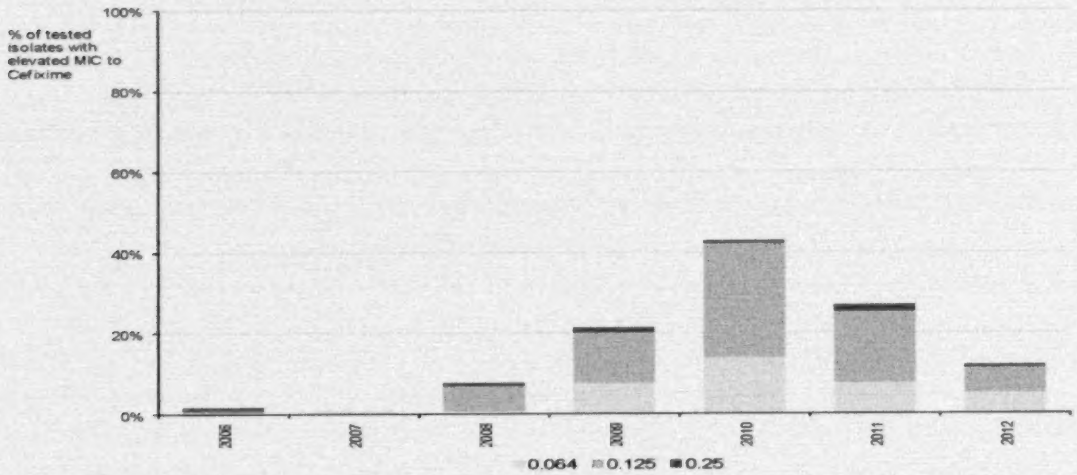
A total of 2,183 isolates were tested between 2006 and 2012, representing 22.4% (2,183/9,762) of all gonorrhea cases reported in the province. While no isolate was fully resistant to cefixime or ceftriaxone[5] and no treatment failures were reported in BC during this period (Figure 21), 0.8% (18/2,183) of isolates showed MIC just below the non-susceptible threshold for cefixime. The increasing trend in percentage of isolates with cefixime or ceftriaxone MIC within three dilutions of the non-susceptible threshold observed between 2006 and 2010 reversed in 2011-2012. The percentage of isolates non-susceptible to azithromycin[6] or within two dilutions of this threshold increased between 2006 and 2011 then decreased in 2012.

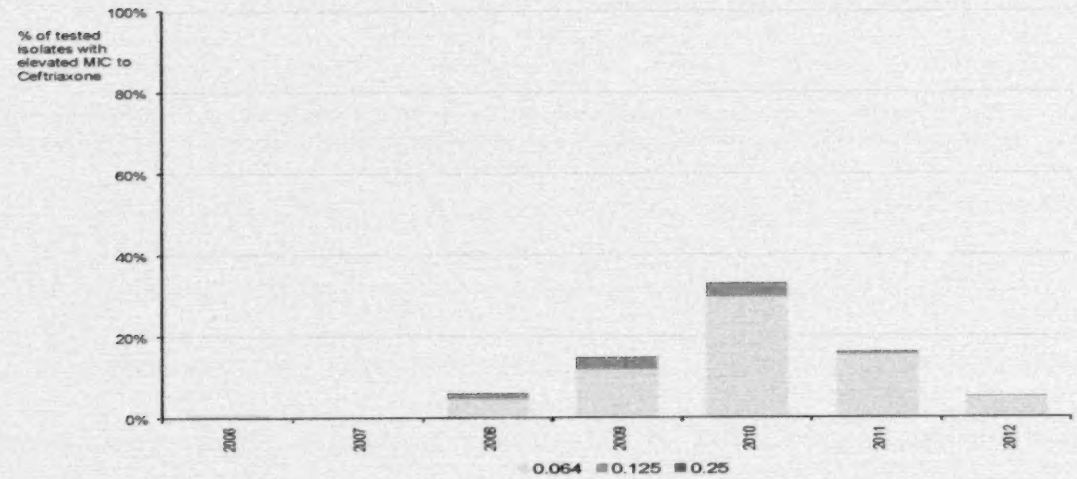
Fifty percent (1,089/2,183) of isolates tested for drug susceptibility were sampled from the urethra, 24.2% (528/2,183) from the rectum, 12.8% (279/2,183) from the cervix, and 11.4% (248/2,183) from the throat.

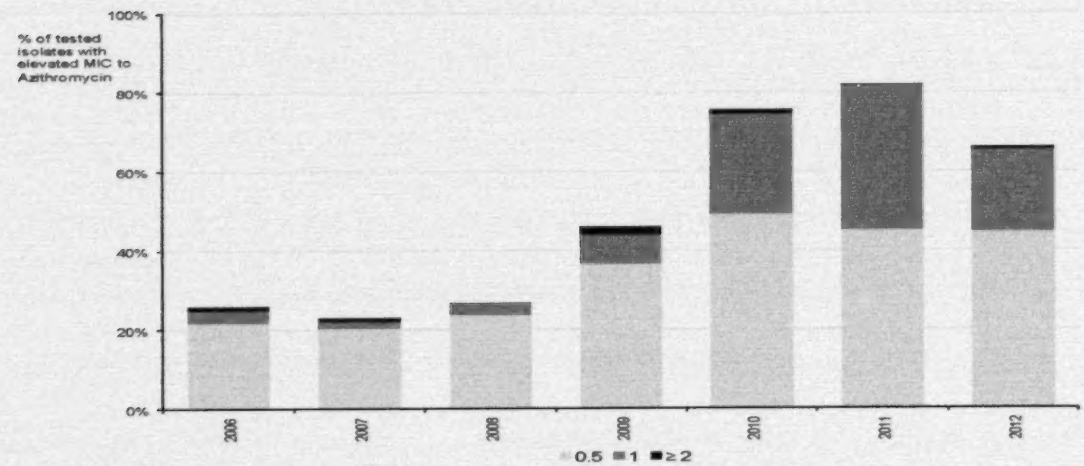
The decline observed in 2011-2012 for reduced susceptibility to cefixime or ceftriaxone among tested isolates is encouraging, and may in part be due to changes in the Canadian and provincial gonorrhea treatment guidelines to more effective regimens. These trends will be closely monitored in order to inform the future evolution of gonorrhea treatment recommendations. The continued threat of emerging resistance reinforces the need for STI prevention and control measures such as increased testing, partner notification for gonorrhea cases, and tests of cure.

21. Percentage of tested *N. gonorrhoeae* isolates with elevated minimum inhibitory concentrations (MIC) to Cefixime, Ceftriaxone, and Azithromycin in BC, 2006 to 2012

Elevated MIC defined here as ≥0.064 µg/mL for cefixime/ceftriaxone (no isolates were considered non-susceptible according to the Clinical and Laboratory Standards Institute (CLSI) threshold of ≥0.5 µg/mL) and ≥0.5 µg/mL for azithromycin (1% of isolates were considered non-susceptible according to threshold of ≥2 µg/mL).







Pelvic Inflammatory Disease and Ectopic Pregnancy

Sexually transmitted infections such as chlamydia and gonorrhea can potentially cause pelvic inflammatory disease (PID) and ectopic pregnancy (EP) in women. Examination of these rates can provide an indicator of the trends in complications that may be due to these STIs. Data are presented up to 2011 due to lags in reporting, collation and transfer of data. Included in this report are data of physician billings (representing inpatient and outpatient treatment) and hospital discharges (representing inpatient treatment) provided by the BC Ministry of Health.

In BC, steady declines in physician billings and hospital discharges related to PID have been observed over time. Rates in hospital discharges for EP have shown a similar trend although physician billings for EP have increased slightly in recent years. These trends – as potential complications of genital chlamydia and gonorrhea – are correlated with and the opposite of trends in these infections among women which have been decreasing over these time periods.[7] This is attributed to the success in public health programs in diagnosis and treatment of these infections over past decades, preventing these complications from developing.

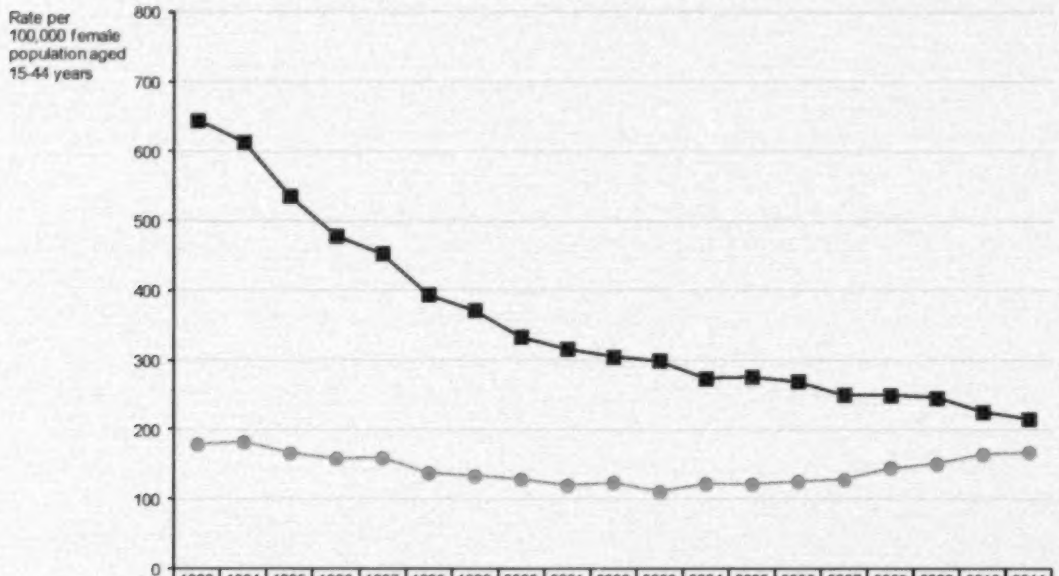
Pelvic Inflammatory Disease

In 2011, the rate of physician billings related to PID decreased to 215.6 (1,990 physician billings) from 225.5 (2,061 physician billings) per 100,000 women aged 15-44 years in 2010 (Figure 22). Rate of hospital discharges related to PID show a decrease to 26.9 (248 hospital discharges) in 2011 from 31.8 (291 hospital discharges) per 100,000 women aged 15-44 years in 2010 (Figure 23).

Ectopic Pregnancy

The rate of physician billings related to EP increased to 167.5 (1,546 physician billings) in 2011 from 164.5 (1,504 physician billings) per 100,000 women aged 15-44 years in 2010 (Figure 22). In contrast, the rate of hospital discharges related to EP have decreased to 50.3 (464 hospital discharges) in 2011 from 53.5 (489 hospital discharges) per 100,000 women aged 15-44 years in 2010 (Figure 23).

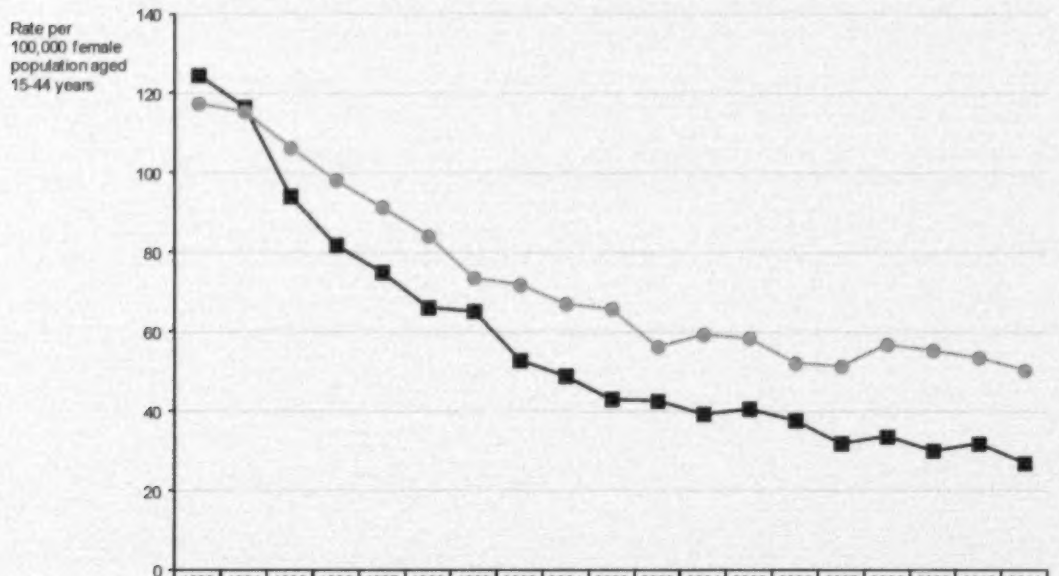
22. Case reports of women aged 15-44 years with a physician billing related to pelvic inflammatory disease or ectopic pregnancy in BC by historical trend, 1993 to 2011



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - PID	5,326	5,196	4,636	4,261	4,089	3,559	3,351	3,002	2,846	2,724	2,652	2,417	2,435	2,377	2,230	2,242	2,225	2,061	1,990
Reports - EP	1,478	1,541	1,436	1,410	1,435	1,241	1,203	1,156	1,078	1,106	979	1,081	1,075	1,107	1,140	1,303	1,365	1,504	1,546
Rate - PID	644.3	613.7	535.9	478.9	453.2	394.4	371.6	333.7	316.2	304.7	299.2	273.7	276.0	269.3	250.7	249.6	245.7	225.5	215.6
Rate - EP	178.8	182.0	166.0	158.5	159.0	137.5	133.4	128.5	119.8	123.7	110.5	122.4	121.8	125.4	128.1	145.1	150.7	164.5	167.5

PID - pelvic inflammatory disease
EP - ectopic pregnancy

23. Case reports of women aged 15-44 years with a hospital discharge related to pelvic inflammatory disease or ectopic pregnancy in BC by historical trend, 1993 to 2011



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - PID	1,030	987	815	728	677	596	588	475	440	385	378	347	358	333	284	302	273	291	248
Reports - EP	971	978	920	874	825	759	664	646	603	588	496	524	515	460	456	510	501	489	464
Rate - PID	124.6	116.6	94.2	81.8	75.0	66.1	65.2	52.8	48.9	43.1	42.6	39.3	40.6	37.7	31.9	33.6	30.1	31.8	26.9
Rate - EP	117.5	115.5	106.3	98.2	91.4	84.1	73.6	71.8	67.0	65.8	56.2	59.3	58.4	52.1	51.3	56.8	55.3	53.5	50.3

PID - pelvic inflammatory disease
EP - ectopic pregnancy

Infectious Syphilis by Region, Gender and Age

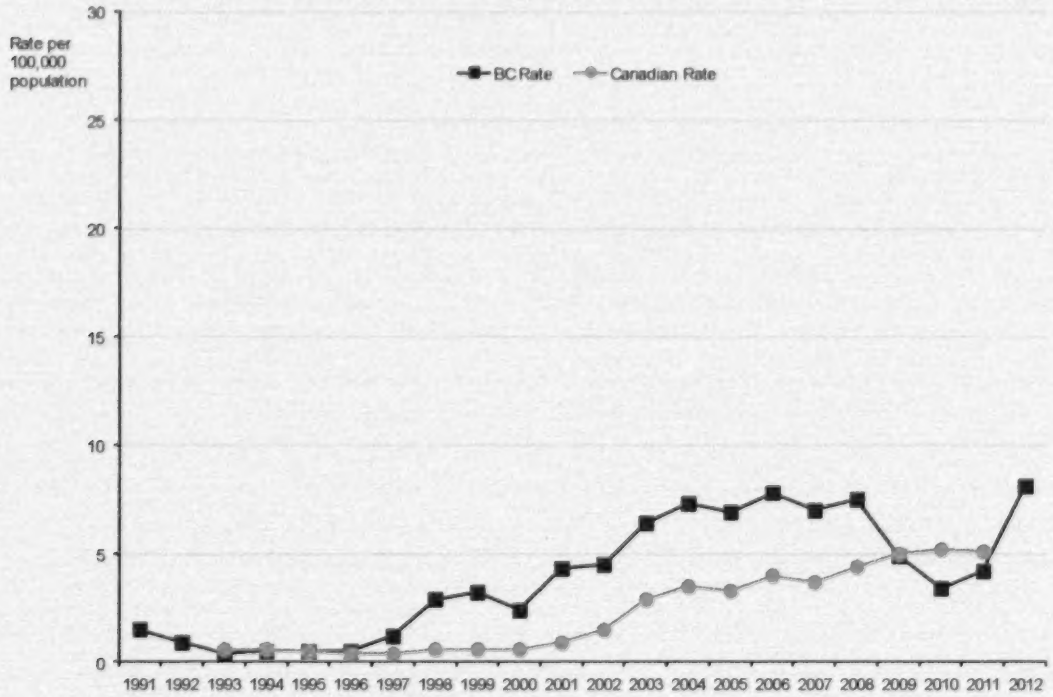
The initial symptoms of syphilis may not always be recognized and without treatment individuals generally enter a prolonged asymptomatic phase. Infectious syphilis rates therefore reflect an underestimate of the total population burden. Syphilis infection can lead to serious complications, including cardiovascular and neurologic disease, and may be fatal.

Following a decline in rates in BC, by the early 1990's infectious syphilis began to re-emerge in BC starting in 1997, corresponding to a series of outbreaks in different populations. While provincial trends had been decreasing in 2009-2010, infectious syphilis rates began to increase in 2011 and this became more evident in 2012. In BC, the rate of infectious syphilis (i.e., primary, secondary and early latent) increased in 2012 to 8.1 (372 cases) from 4.2 (190 cases) per 100,000 population in 2011 (Figure 24). The highest rates of infectious syphilis were in Vancouver Coastal and Fraser Health Authorities (Figure 26). Across Health Service Delivery Areas, the highest rates were in Vancouver, Richmond and Fraser North (Figure 25).

Although male infectious syphilis rates decreased in 2009 and 2010, male cases have since risen in 2011 and 2012 (177 cases in 2011 and 346 cases in 2012). Similarly, female rates of infectious syphilis started declining in 2006 and have also risen in 2012 (Figure 27) (25 cases in 2012 compared to 13 cases in 2011). The increase in cases among males in 2012 was observed in all age groups with the highest rates in those aged 30-59 years. Increasing trends since 2010 are observed in most age groups for both males and females.

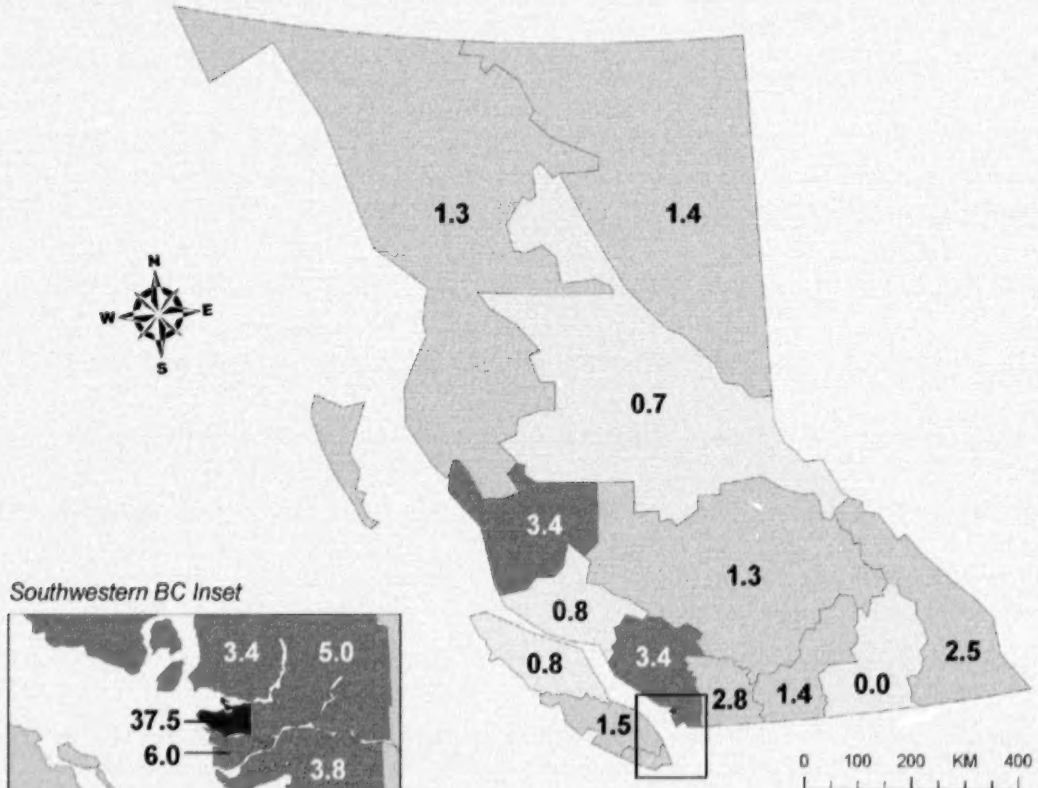
While final results for 2013 are not yet available, provincial infectious syphilis rates are continuing to increase. As of January 23, 2014, there were 561 infectious syphilis cases in BC in 2013 (preliminary estimate) compared to 372 cases for all of 2012.

24. Infectious syphilis case reports in BC and Canada by historical trend, 1991 to 2012*



2011 Canadian rate is preliminary and subject to change
*2012 Canadian rate is not available

25. Infectious syphilis case reports in BC by health service delivery area, 2012



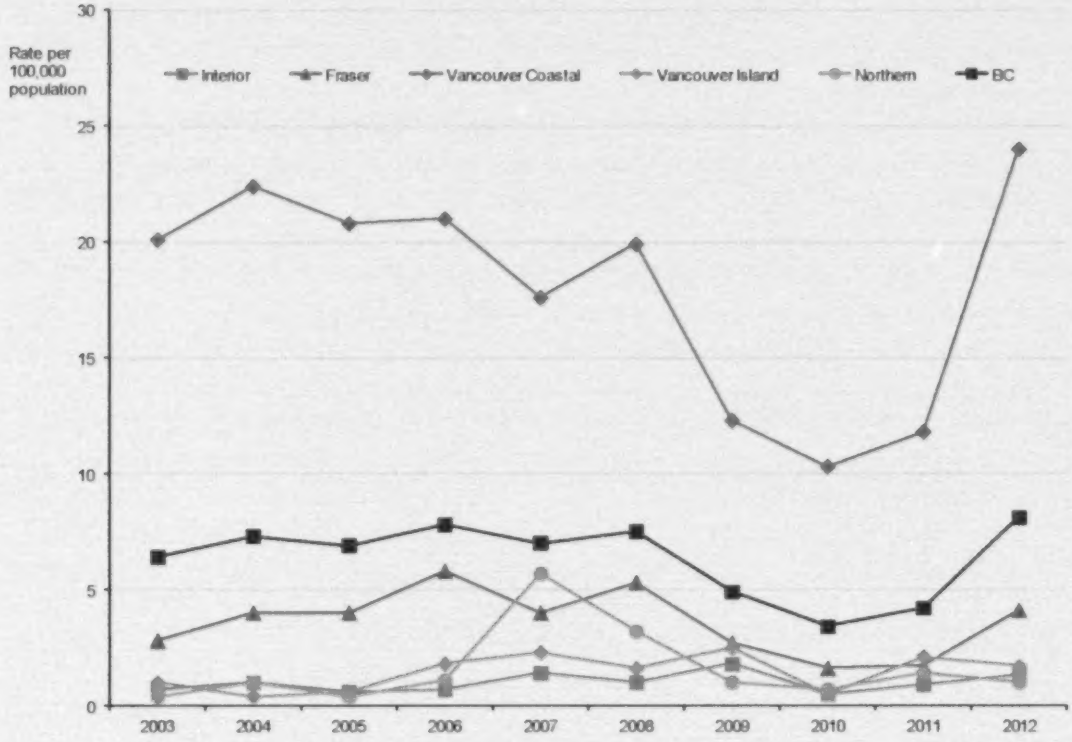
Rate per 100,000 population by HSDA

- 0.0 - 0.8
- 1.3 - 2.8
- 3.4 - 6.0
- 37.5

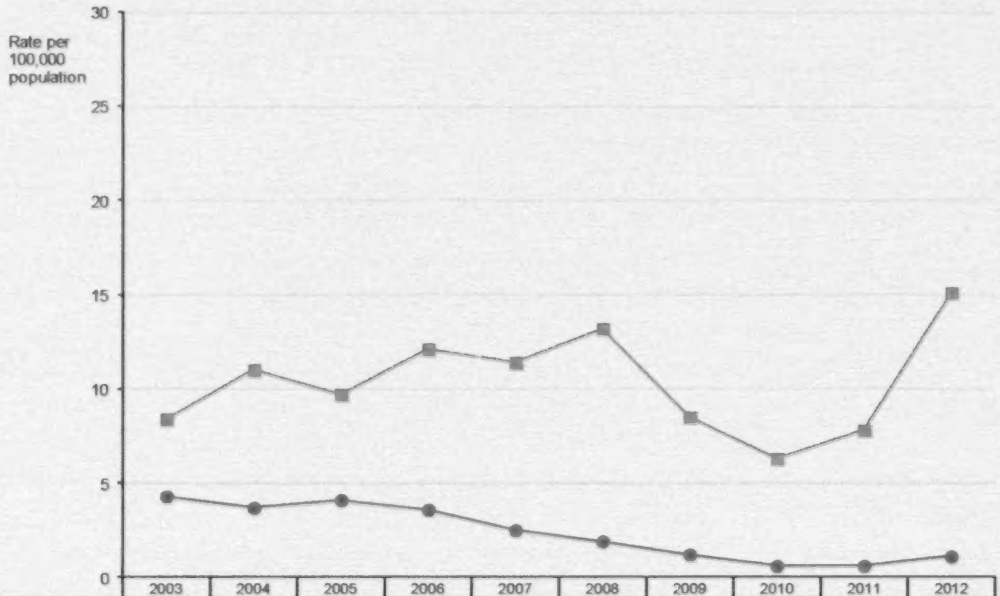
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	2	2.5
12	Kootenay Boundary	0	0.0
13	Okanagan	5	1.4
14	Thompson Cariboo Shuswap	3	1.3
21	Fraser East	8	2.8
22	Fraser North	31	5.0
23	Fraser South	28	3.8
31	Richmond	12	6.0
32	Vancouver	257	37.5
33	North Shore/Coast Garibaldi	10	3.4
41	South Vancouver Island	8	2.1
42	Central Vancouver Island	4	1.5
43	North Vancouver Island	1	0.8
51	Northwest	1	1.3
52	Northern Interior	1	0.7
53	Northeast	1	1.4

Rates calculated with population estimates released by BC Stats

26. Infectious syphilis case reports in BC by health authority, 2003 to 2012



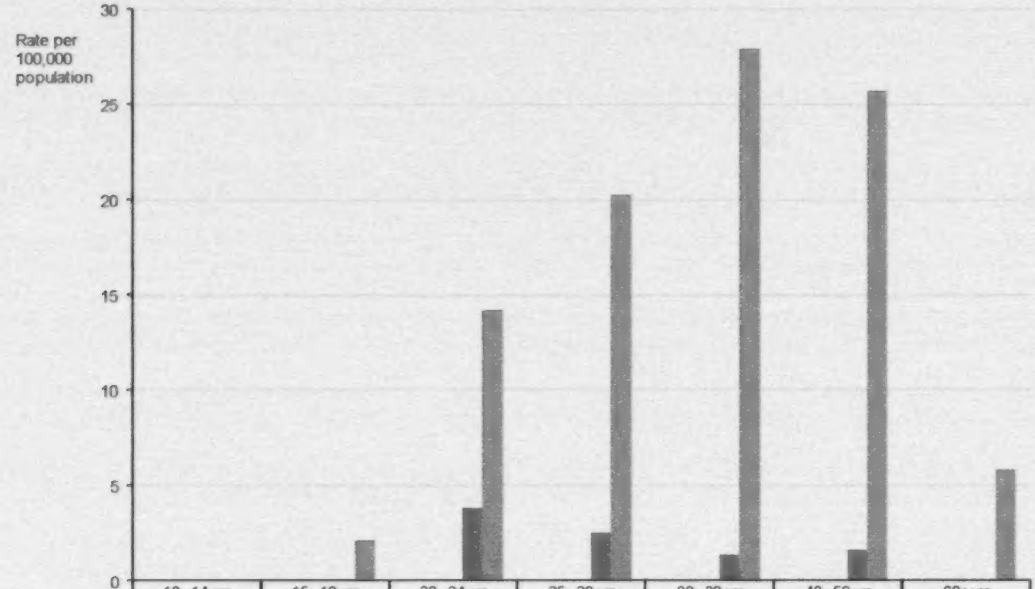
27. Infectious syphilis case reports in BC by gender, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Reports - Female	89	78	86	77	55	41	28	13	13	25
Reports - Male	171	226	202	254	244	286	189	141	177	346
Reports - Other *	2	1	0	0	1	1	0	0	0	1
Rate - Female	4.3	3.7	4.1	3.6	2.5	1.9	1.2	0.6	0.6	1.1
Rate - Male	8.4	11.0	9.7	12.1	11.4	13.2	8.5	6.3	7.8	15.1

* Other - transgender and gender unknown

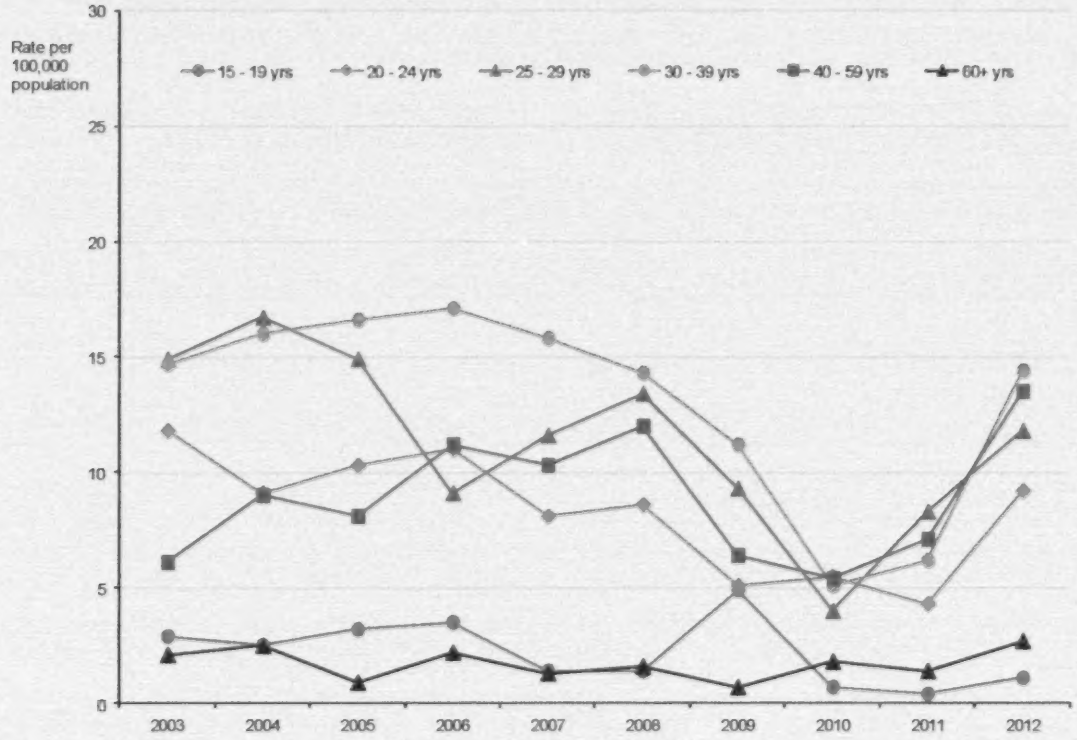
28. Infectious syphilis case reports in BC by age group and gender, 2012



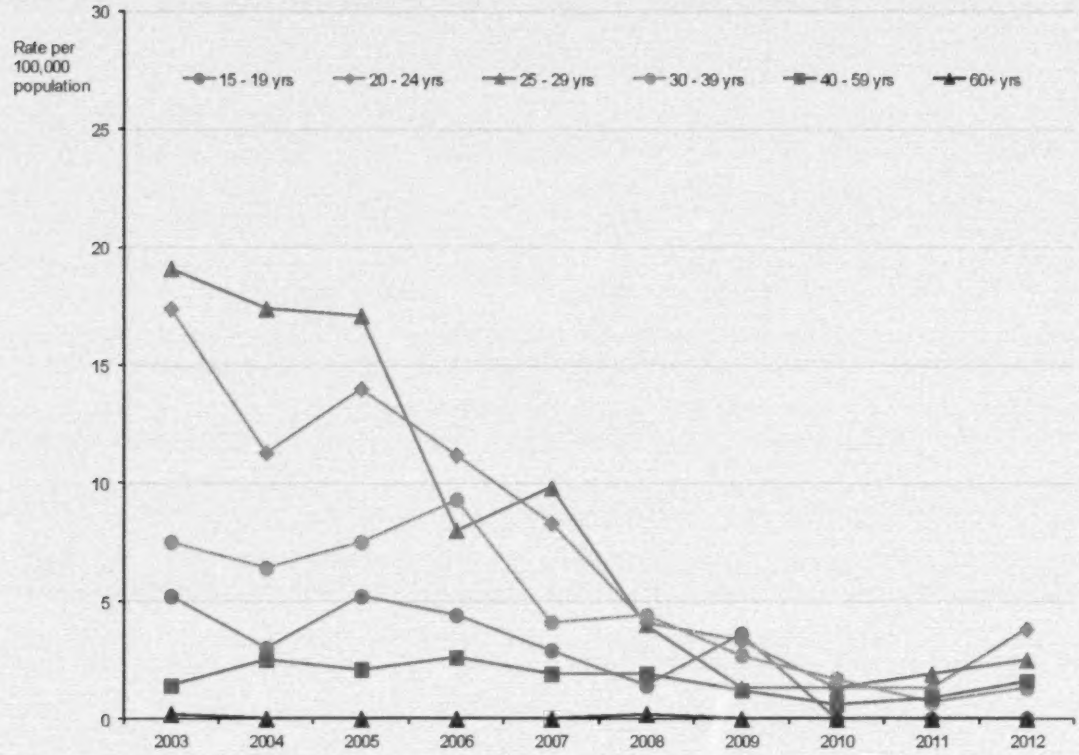
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	0	0	6	4	4	11	0
Reports - Male	0	3	24	34	83	174	28
Reports - Other *	0	0	0	1	0	0	0
Rate - Female	0.0	0.0	3.8	2.5	1.3	1.6	0.0
Rate - Male	0.0	2.1	14.2	20.2	27.9	25.7	5.8

* Other - transgender and gender unknown

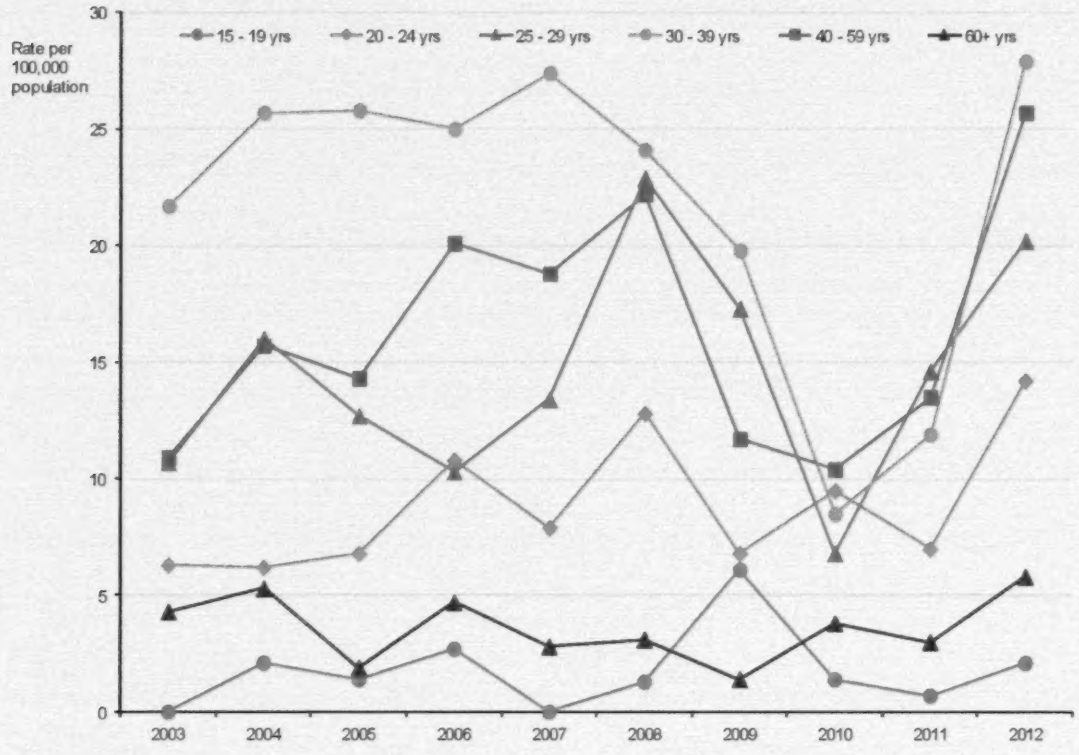
29. Infectious syphilis case reports in BC by age group - total, 2003 to 2012



30. Infectious syphilis case reports in BC by age group - female, 2003 to 2012



31. Infectious syphilis case reports in BC by age group - male, 2003 to 2012



Infectious Syphilis by Ethnicity

The majority of cases in 2012 are among people identified as Caucasian (234 cases; 62.9%) (Figure 32). In comparison to males, the proportion of infectious syphilis cases among females of Caucasian ethnicity is generally lower, however, the trends are highly variable due to the small number of female cases each year (i.e., 25 cases in 2012) (Figure 33).

32. Percentage of infectious syphilis case reports in BC by ethnicity - total, 2003 to 2012

Ethnicity	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. Diagnoses	*262*	*305*	*288*	*331*	*300*	*328*	*217*	*154*	*190*	*372*
Caucasian	55.0	62.0	56.9	59.5	63.7	62.2	60.4	68.2	65.3	62.9
Aboriginal	16.8	10.5	14.9	12.4	10.7	8.8	8.3	3.9	3.7	4.8
Asian	11.8	8.5	11.1	10.6	8.3	10.1	5.5	11.0	10.0	10.8
South Asian	5.3	3.3	4.2	5.7	4.3	4.3	1.4	1.9	5.8	3.5
Hispanic	2.3	4.3	4.9	4.2	4.0	4.3	9.2	1.9	6.8	5.6
Black	3.8	2.6	2.1	2.4	2.3	2.7	2.8	1.9	0.5	1.1
Other*/UNK	5.0	8.9	5.9	5.1	6.7	7.6	12.4	11.0	7.9	11.3

33. Percentage of infectious syphilis case reports in BC by ethnicity - female, 2003 to 2012

Ethnicity	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. Diagnoses	*89*	*78*	*86*	*77*	*55*	*41*	*28*	*13*	*13*	*25*
Caucasian	49.4	47.4	37.2	39.0	52.7	29.3	39.3	61.5	38.5	32.0
Aboriginal	33.7	29.5	37.2	42.9	36.4	29.3	28.6	15.4	15.4	20.0
Asian	3.4	11.5	11.6	7.8	5.5	12.2	0.0	0.0	23.1	16.0
South Asian	3.4	1.3	1.2	6.5	3.6	9.8	3.6	0.0	7.7	12.0
Hispanic	2.2	2.6	5.8	0.0	0.0	0.0	0.0	0.0	7.7	0.0
Black	2.2	0.0	1.2	0.0	0.0	2.4	3.6	7.7	0.0	4.0
Other*/UNK	5.6	7.7	5.8	3.9	1.8	17.1	25.0	15.4	7.7	16.0

34. Percentage of infectious syphilis case reports in BC by ethnicity - male, 2003 to 2012

Ethnicity	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. Diagnoses	*171*	*226*	*202*	*254*	*244*	*286*	*188*	*141*	*177*	*346*
Caucasian	58.5	67.3	65.3	65.7	66.4	67.1	63.5	68.8	67.2	65.0
Aboriginal	7.6	3.5	5.4	3.1	4.9	5.6	5.3	2.8	2.8	3.8
Asian	16.4	7.5	10.9	11.4	9.0	9.8	6.3	12.1	9.0	10.4
South Asian	5.8	4.0	5.4	5.5	4.5	3.5	1.1	2.1	5.6	2.9
Hispanic	2.3	4.9	4.5	5.5	4.5	4.9	10.6	2.1	6.8	6.1
Black	4.7	3.5	2.5	3.1	2.9	2.8	2.6	1.4	0.6	0.9
Other*/UNK	4.7	9.3	5.9	5.5	7.8	6.3	10.6	10.6	7.9	11.0

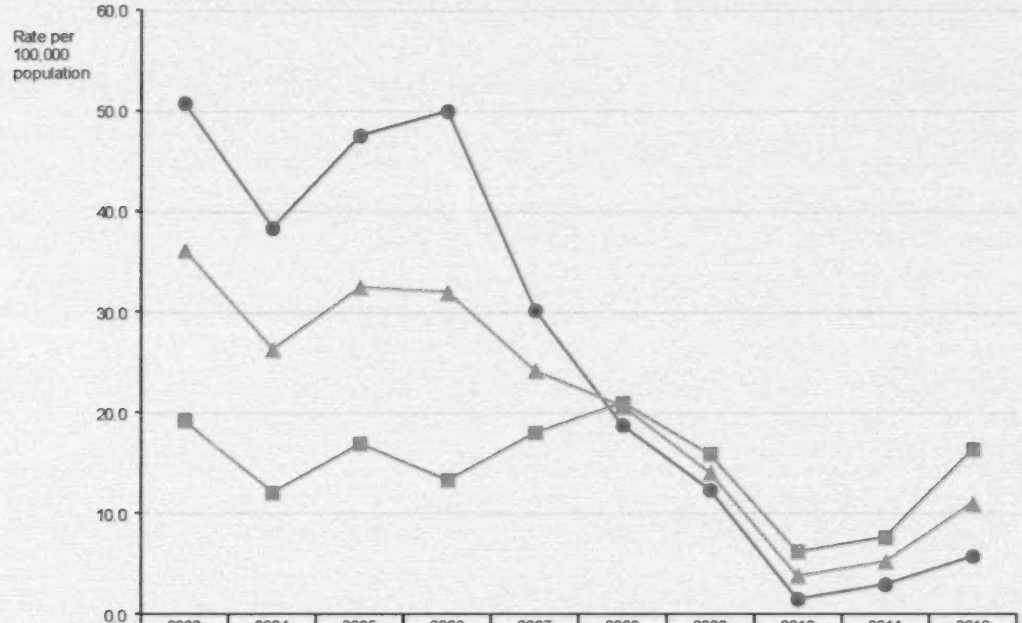
* Other - Arab/West Asian and other/mixed ethnicity
UNK - ethnicity unknown

Infectious Syphilis among Aboriginal Peoples

From 2003 until 2011, the proportion of infectious syphilis cases among Aboriginal people in BC decreased. In 2012, the proportion of cases among Aboriginal people increased slightly to 4.8% (18 cases) from 3.7% (7 cases) in 2011, consistent with overall provincial trends. The proportion of cases who self-identified as Aboriginal in 2012 was consistent with the proportional representation of the provincial Aboriginal population (~5%) (Figure 32).[8] While numbers are small, Aboriginal women in BC are disproportionately represented among all female infectious syphilis cases (5 cases, 20.0%).

Consistent with overall provincial trends, between 2003 and 2010 the rate of infectious syphilis among First Nations people in BC decreased and in 2012 increased to 11.0 (15 cases) from 5.3 (7 cases) per 100,000 population in 2011. Due to limitations in the availability of population estimates it is not possible to calculate comparable rates for Métis and Inuit cases. (See Technical Appendix for further details about the classification of ethnicity for syphilis cases and First Nations population estimates.)

35. Infectious syphilis case reports among First Nations people in BC by gender, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Rate - Female	50.8	38.3	47.5	49.9	30.2	18.8	12.3	1.5	3.0	5.8
Rate - Male	19.3	12.1	16.9	13.3	18.1	21.0	15.9	6.3	7.6	16.4
Rate - Total	36.2	26.3	32.5	31.9	24.2	20.7	14.1	3.9	5.3	11.0

Rates based on First Nations population estimates from Aboriginal Affairs and Northern Development Canada (AANDC)

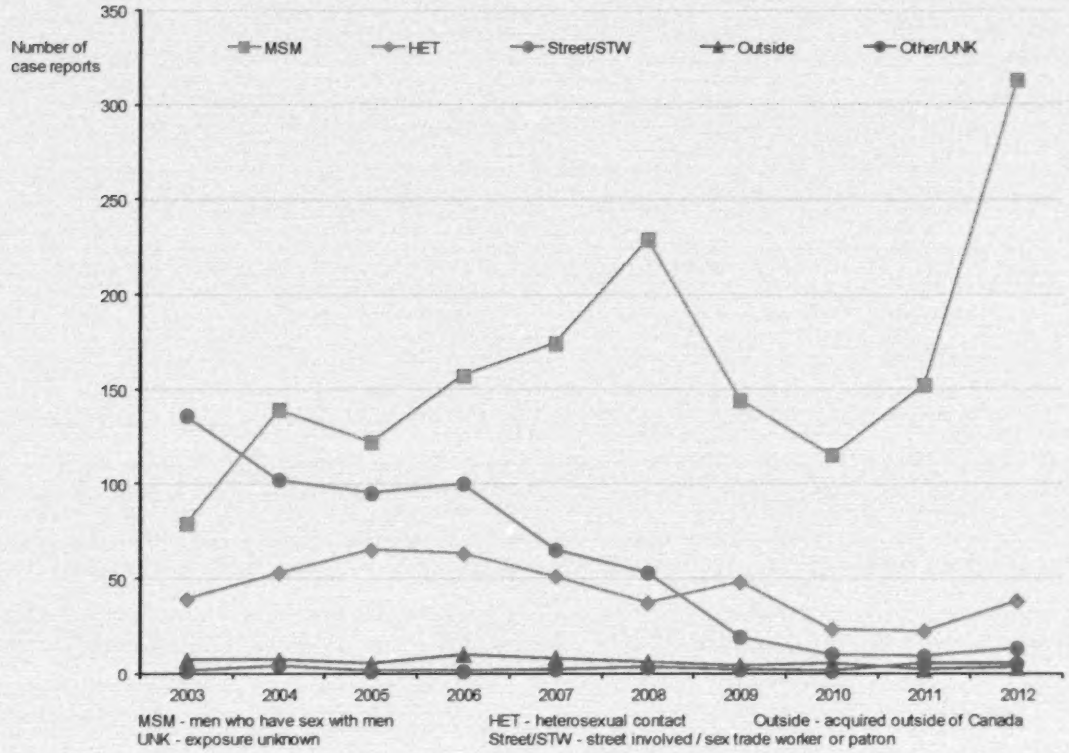
Infectious Syphilis by Exposure Category

Gay, bisexual and other men who have sex with men (MSM) continue to comprise the greatest number of infectious syphilis cases in BC (Figure 37). The number of syphilis cases among MSM increased from 152 cases (80.0% of all cases) in 2011 to 313 cases (84.1%) in 2012. Infectious syphilis cases among heterosexual persons without other risk factors increased from 22 cases (11.6 %) in 2011 to 38 cases (10.2%) in 2012. The number of infectious syphilis cases among street involved persons, sex trade workers and their patrons has continued to decrease in recent years (9 cases, 4.7% in 2011 and 13 cases, 3.5% in 2012). Trends among MSM in BC are explored in more detail in the next section.

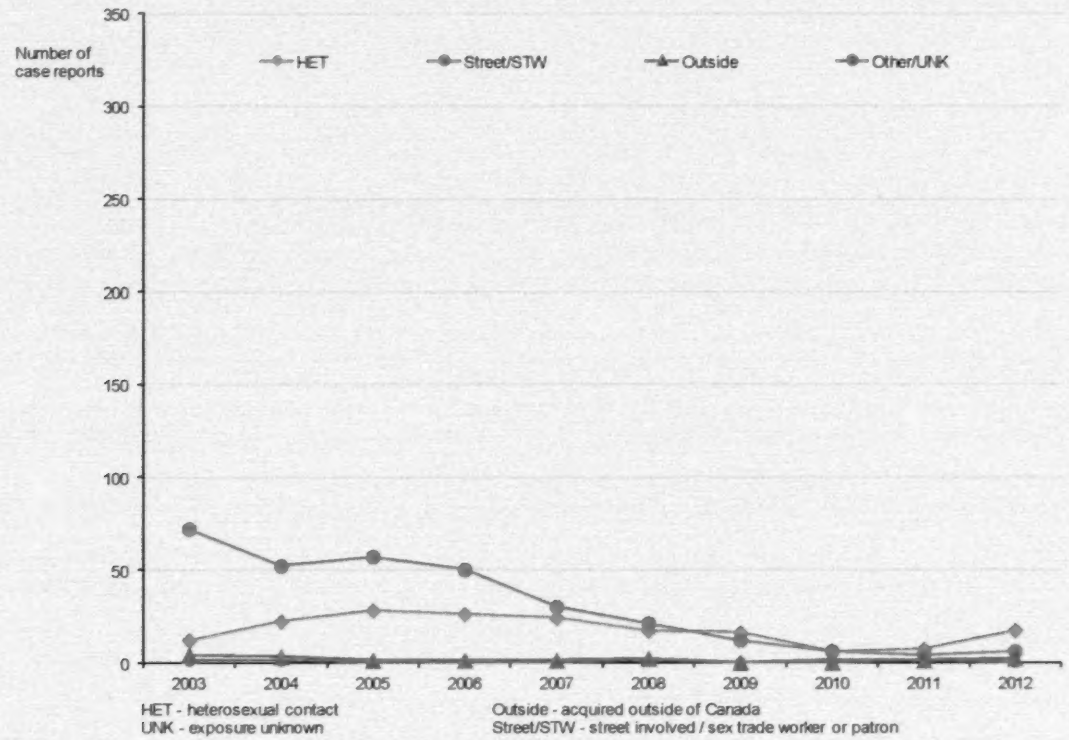
36. Infectious syphilis case reports in BC by exposure category and health authority, 2003 to 2012

Health Authority	Exposure Category	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Interior	MSM	1	2	1	2	7	2	5	1	3	7
	Street/STW	2	1	0	1	3	3	1	1	0	0
	HET	1	4	3	2	0	2	7	2	4	2
	Outside	1	0	0	0	0	0	0	0	0	1
	Other/UNK	0	0	0	0	0	0	0	0	0	0
Fraser	MSM	13	13	10	22	13	41	25	17	15	48
	Street/STW	18	25	23	35	23	20	4	2	2	4
	HET	6	16	22	25	21	15	13	5	7	12
	Outside	3	4	3	3	3	5	1	2	0	2
	Other/UNK	0	0	0	1	1	1	0	0	3	1
Vancouver Coastal	MSM	62	123	108	129	136	179	107	94	120	248
	Street/STW	112	74	71	62	34	23	8	7	6	8
	HET	31	30	37	27	15	14	18	13	6	19
	Outside	3	3	2	6	5	1	3	3	2	0
	Other/UNK	0	3	1	0	0	1	1	1	2	4
Vancouver Island	MSM	3	1	1	4	7	6	6	3	13	10
	Street/STW	3	1	1	0	3	3	4	0	0	0
	HET	1	0	2	8	7	2	8	1	3	3
	Outside	0	0	0	1	0	0	0	0	0	0
	Other/UNK	0	1	0	0	0	1	1	0	0	0
Northern	MSM	0	0	0	0	6	1	0	0	1	0
	Street/STW	1	1	0	2	2	4	1	0	1	1
	HET	0	2	1	1	8	4	2	2	2	2
	Outside	0	0	0	0	0	0	0	0	0	0
	Other/UNK	0	0	0	0	0	0	0	0	0	0

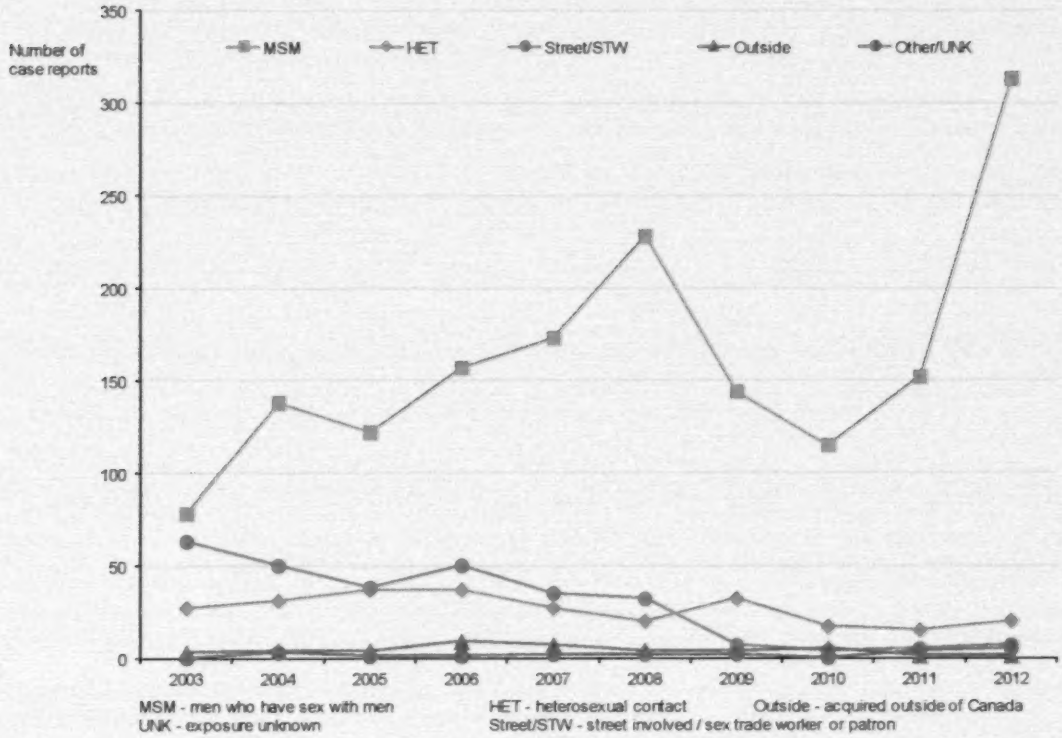
37. Infectious syphilis case reports in BC by exposure category - total, 2003 to 2012



38. Infectious syphilis case reports in BC by exposure category - female, 2003 to 2012



39. Infectious syphilis case reports in BC by exposure category - male, 2003 to 2012



Infectious Syphilis among Men who have Sex with Men

Gay, bisexual and other men who have sex with men (MSM) continue to be disproportionally affected by the current infectious syphilis epidemic in BC, constituting 84.1% (313 cases) of all cases in 2012 (Figure 37). While cases of infectious syphilis among other exposure categories (i.e., heterosexual persons and street involved/sex trade worker populations) have peaked in 2003, trends among MSM remain elevated and, in 2011 a two-year decreasing trend was reversed. This increasing trend continued in 2012. This is similar to the profile of syphilis epidemics in other Canadian provinces, the US and several European countries where syphilis cases were also predominantly among MSM.[9, 10, 11, 12]

Although final numbers for 2013 are not yet available, the provincial increase in infectious syphilis cases observed in 2013 continued to be influenced primarily by a continued increase in cases among MSM in BC.

There were 313 cases among MSM in 2012; 22.4% (70 cases) were diagnosed with primary syphilis, 18.2% (57 cases) with secondary syphilis, and 59.4% (186 cases) were diagnosed with early latent disease. The proportion of infectious syphilis cases among MSM in the early latent stage of infection has steadily increased over time which may reflect increased syphilis testing. In 2012, 78 individuals (24.9%) had ever had a previous syphilis diagnosis, highlighting the importance of repeat infections in the current epidemic.

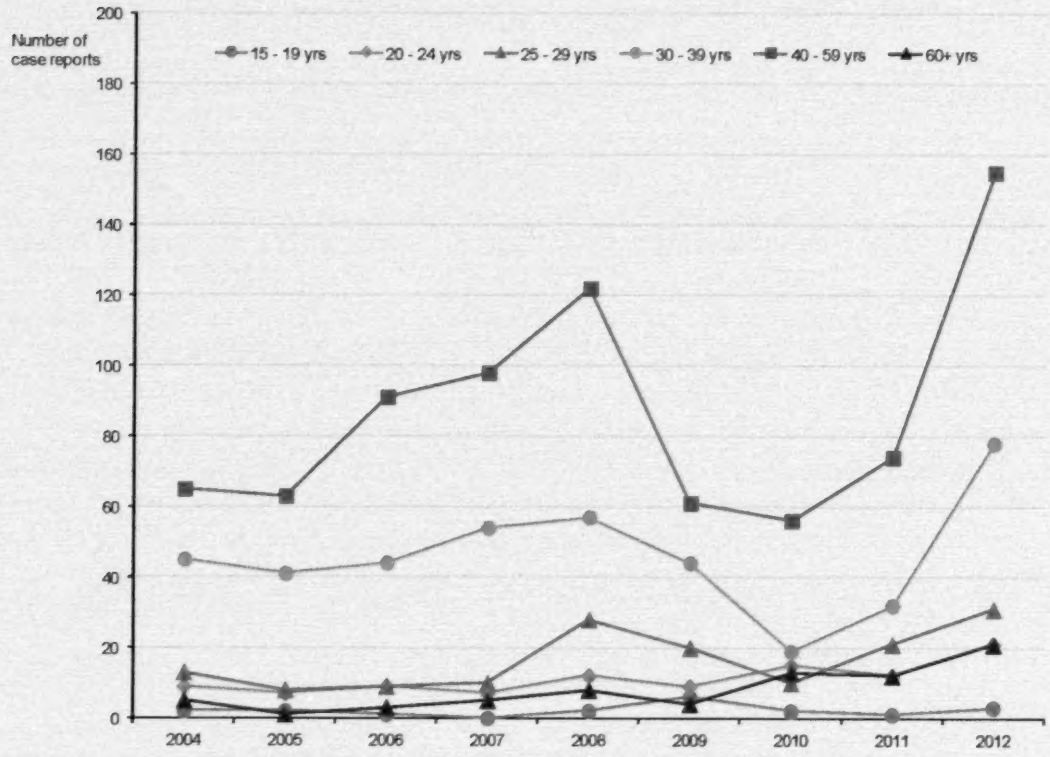
Despite recent fluctuations in the number of annual cases, the characteristics of MSM with syphilis have remained similar over time. The mean age of MSM diagnosed with syphilis was 41.8 years (range 16-74 years) in 2012 (Figure 40). In 2012, the majority of cases resided in the lower mainland with 88.8% (278 cases) residing in Vancouver Coastal, 6.7% (21 cases) in Fraser, 2.9% (9 cases) on Vancouver Island, and 1.6% (5 cases) in other Health Authorities. As in previous years, the majority of cases in 2012 were among Caucasian (206, cases, 65.8%), Asian (30 cases, 9.6%), and Hispanic (20 cases, 6.4%) men (Figure 41).

Being HIV positive continues to be an important risk factor for acquiring infectious syphilis. In 2012, of the MSM cases with a known HIV status (290 cases), 65.9% (191 cases) were HIV positive at the time of their syphilis diagnosis which is an increase from 2011 (78/146 cases, 53.4%) (Figure 42).

A recent review of infectious syphilis cases among MSM in BC was undertaken, comparing the characteristics of cases during this recent increase (2010-2012) to earlier infectious syphilis cases among MSM did not identify any clear differences between recent and earlier cases suggesting that the recent increase is a resurgence of an ongoing epidemic (and not a new outbreak in a different population of MSM).[13] One finding from this review was that the proportion of cases each year diagnosed with early latent syphilis was increasing over time which may suggest that an increase in syphilis testing uptake or frequency over time is contributing to the increase.

Other factors are also contributing to the ongoing epidemic of infectious syphilis among MSM. Notably, almost two-thirds of syphilis cases among MSM in 2012 were HIV positive. The possible roles of core sexual networks and the biological synergy between HIV and syphilis are important areas of study which may help explain this trend. While centralized public health follow-up, partner notification, and partner testing for all syphilis cases remain the cornerstone to controlling the syphilis epidemic, public health and community organizations have been partnering on new syphilis initiatives for MSM in BC, including both a series of social marketing testing campaigns and the education of health care providers in 2012. Given the continued increase of syphilis cases in 2013, the enhancement of ongoing programs and development of new syphilis control interventions for MSM remain a priority in BC.

40. Infectious syphilis case reports among MSM in BC by age group, 2004 to 2012

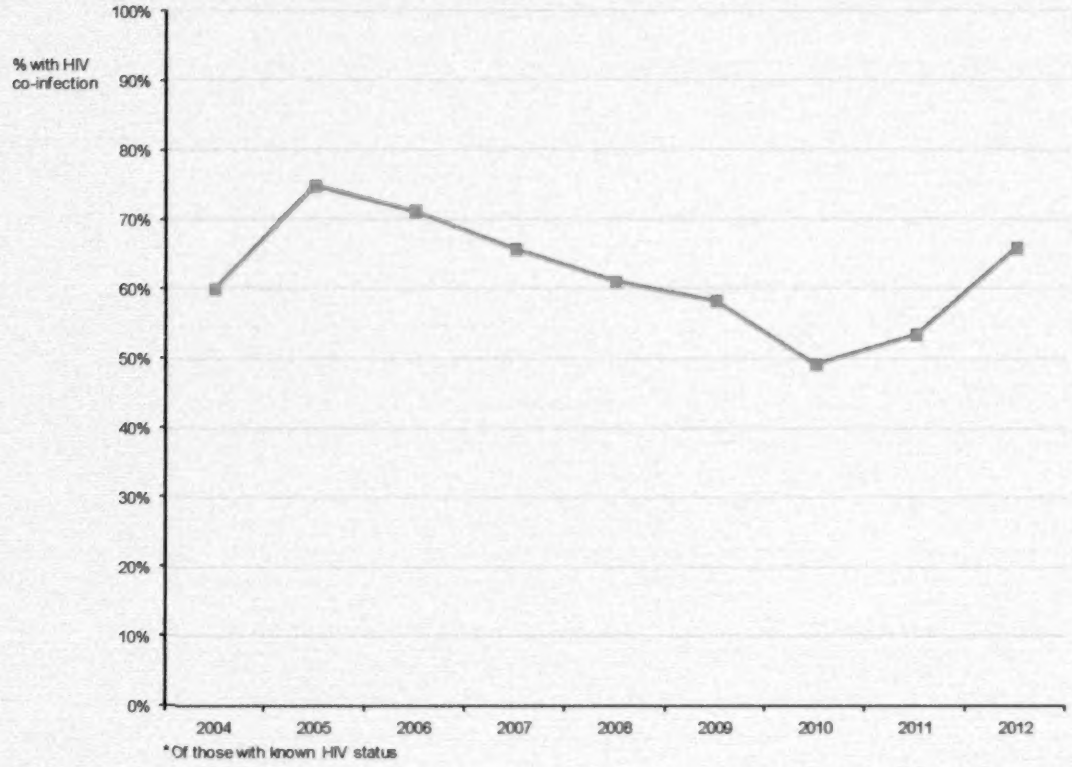


41. Percentage of infectious syphilis case reports among MSM in BC by ethnicity, 2004 to 2012

Ethnicity	2004	2005	2006	2007	2008	2009	2010	2011	2012
No. Diagnoses	*138*	*122*	*157*	*173*	*228*	*144*	*115*	*152*	*313*
Caucasian	75.5	75.4	79.0	71.8	73.8	66.7	73.9	70.4	65.8
Aboriginal	2.9	2.5	0.6	2.3	2.6	3.5	3.5	2.0	3.5
Asian	5.8	9.0	6.4	8.0	9.2	5.6	7.8	7.2	9.6
South Asian	2.2	3.3	2.5	2.9	3.1	0.0	2.6	4.6	2.9
Hispanic	5.0	1.6	6.4	5.7	4.8	12.5	2.6	7.9	6.4
Black	2.2	1.6	1.3	3.4	1.3	2.8	0.9	0.0	1.0
Other*/UNK	6.5	6.6	3.8	5.7	5.2	9.0	8.7	7.9	10.9

* Other - Arab/West Asian and other/mixed ethnicity
UNK - ethnicity unknown

42. Infectious syphilis case reports* among MSM in BC by HIV co-infection, 2004 to 2012

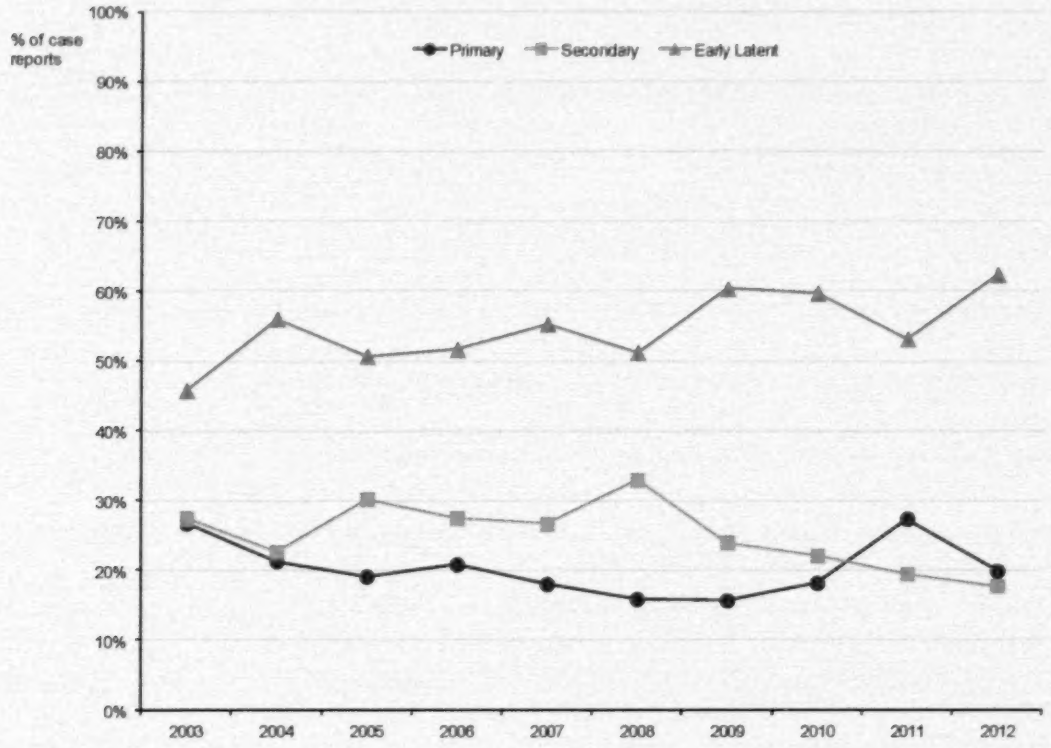


Stage of Infection at Time of Syphilis Diagnosis

There have been slow changes in the proportion of infectious syphilis cases by stage of infection (primary, secondary and early latent) over time. Most notably, the proportion of cases that are early latent syphilis has been increasing over time and in 2012 increased to 62.4% (232 cases) from 53.2% (101 cases) in 2011 (Figure 43). This may reflect a greater uptake of syphilis testing or screening (i.e., which would be more likely to pick up infectious syphilis at a later stage).

From 2003 to 2012, 5.1% (141/2,747 cases) of infectious syphilis cases were also diagnosed with neurosyphilis. Neurosyphilis is commonly considered to be indicative of advanced syphilis disease but may also occur at an early stage of infection.

43. Stage of infection at time of syphilis diagnosis, 2003 to 2012

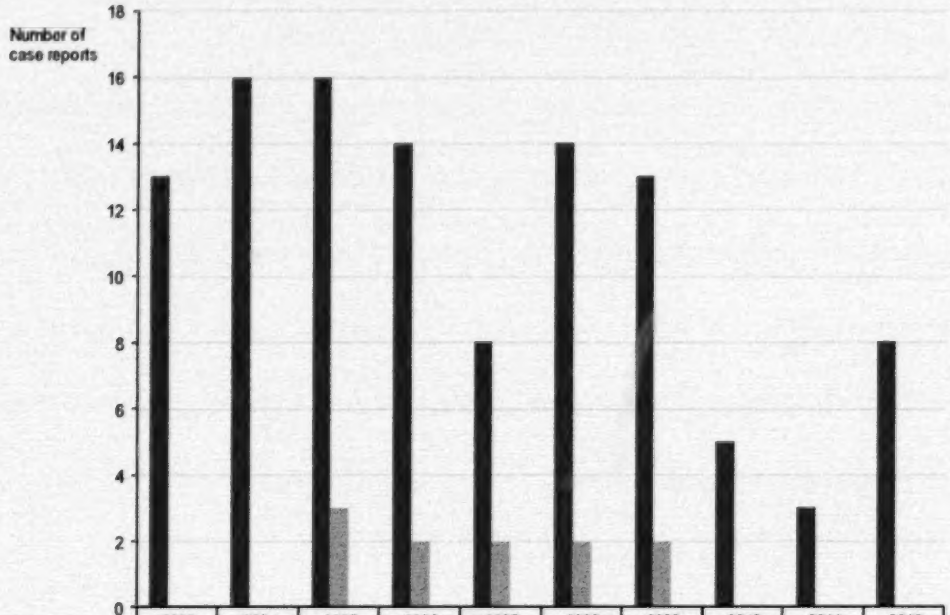


Maternal and Early Congenital Syphilis

Infectious syphilis acquired prior to or during pregnancy can be passed from a mother to her infant which can have serious consequences, including infant death. Accordingly, prenatal screening for syphilis is routinely recommended for all pregnant women in BC, as treatment will reduce the risk of transmission to or complications in infants.

There were no cases of congenital syphilis identified in BC between 2010 and 2012 (Figure 44). In 2012, eight maternal syphilis cases were reported, an increase from three reported cases in 2011.

44. Maternal and early congenital syphilis case reports in BC, 2003 to 2012



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Reports - Maternal	13	16	16	14	8	14	13	5	3	8
Reports - Early Congenital	0	0	3	2	2	2	2	0	0	0
Rate * - Early Congenital	0.0	0.0	7.4	4.8	4.6	4.5	4.5	0.0	0.0	0.0

* Rate per 100,000 live births

Endnotes

[1] Reference to the "arrested immunity" hypothesis: Brunham RC, Rekart ML. (January 2008). The arrested immunity hypothesis and the epidemiology of chlamydia control. *Sexually Transmitted Diseases*, 35(1), 53-54.

[2] Reference to the "arrested immunity" hypothesis: Rekart ML, Gilbert M, Meza R, Kim PH, Chang M, Money DM, Brunham RC. (2012). Chlamydia public health programs and the epidemiology of pelvic inflammatory disease and ectopic pregnancy. *Journal of Infectious Diseases*, advance access published October 24, 2012. Retrieved from http://jid.oxfordjournals.org/content/early/2012/10/24/infdis.jis644.full.pdf?keytype=ref&ijkey=y7YveY9ycdjbCr2

[3] For more information about lymphogranuloma venereum (LGV) in BC: BC Centre for Disease Control. (2012, March). Lymphogranuloma venereum in British Columbia, 2004 to 2011. Retrieved from http://www.bccdc.ca/dis-cond/a-z/_s/SexuallyTransmittedInfections/statsres/default.htm

[4] For more information about the Canadian treatment guidelines for gonorrhea: Public Health Agency of Canada website http://www.phac-aspc.gc.ca/std-mts/sti-its/cgsti-ldcits/section-5-6-eng.php

[5] Minimum inhibitory concentration (MIC) breakpoints to define "resistance" to cefixime and ceftriaxone have not yet been established, however, the Clinical and Laboratory Standards Institute (CLSI) defines MIC ≤ 0.25 µg/mL as susceptible.

[6] The US Centers for Disease Control and Prevention (CDC) has proposed MIC ≥2 µg/mL as the non-susceptible threshold for azithromycin.

[7] Reference to the declines in pelvic inflammatory disease and ectopic pregnancy as chlamydia rates are steadily increasing: Brunham RC, Rekart ML. (January 2008). The arrested immunity hypothesis and the epidemiology of chlamydia control. *Sexually Transmitted Diseases*, 35(1), 53-54.

[8] BC Stats. Census Statistical Profiles of Aboriginal Peoples, 2006. Retrieved from http://www.bcstats.gov.bc.ca/statisticsbysubject/AboriginalPeoples/CensusProfiles.aspx

[9] Reference to the increase in infectious syphilis cases among MSM: US Center for Disease Control, 2011. Retrieved from http://www.cdc.gov/std/stats11/syphilis.htm

[10] Reference to the increase in infectious syphilis cases among MSM: Savage EJ, Hughes G, Ison C, Lowndes CM, the European Surveillance of Sexually Transmitted Infections (ESSTI) network. (November 2009). Syphilis and gonorrhea in men who have sex with men: a European overview. *Euro Surveillance*, 14(47). Retrieved from http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19417

[11] Reference to the increase in infectious syphilis cases among MSM: Public Health Agency of Canada. (2009). Executive Summary - Report on sexually transmitted infections in Canada: 2009. Retrieved from http://www.phac-aspc.gc.ca/sti-its-surv-epi/sum-som-eng.php

[12] Reference to the increase in infectious syphilis cases among MSM: Santé et Services Sociaux Québec. (2011). Portrait des infections transmissible sexuellement et par le sang (ITSS) au Québec - année 2010 (et projections 2011). Retreived from http://www.msss.gouv.qc.ca/sujets/prob_sante/itss/index.php?statistiques_au_quebec

[13] Reference to the increase in infectious syphilis cases among MSM: BC Centre for Disease Control. (2013, June). Infectious syphilis among gay, bisexual and other men who have sex with men in British Columbia, 2003 - 2012. http://www.bccdc.ca/dis-cond/a-z/_s/Syphilis/statsres/default.htm

[14] Clinical presentation includes any evidence of congenital syphilis on physical examination (e.g., hepatosplenomegaly), evidence of congenital syphilis on radiographs of long bones, a reactive CSF VDRL, an elevated CSF cell count or protein without other cause. Note that neonates may not display clinical manifestations of congenital syphilis and may meet laboratory criteria only.

Contributors

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Technical Appendix

Data Limitations

There are several key limitations to surveillance data which are important to understand in order to interpret surveillance data appropriately.

- Surveillance data are only reflective of the proportion of the population who test. Individuals with infections who have not tested are not included in the surveillance data presented in this report. Many people with sexually transmitted infections do not have symptoms and so do not seek health care advice or testing. This under-counting of cases may disproportionately affect some groups. For example, more women than men get syphilis testing in BC because of prenatal syphilis screening. Also, some sexually transmitted infections are more or less likely to show symptoms depending on sex and site of infection (e.g., urethral gonococcal infections in men are more likely to produce symptoms than those in women, or those in the pharynx/throat).

- Surveillance trends are also influenced by provider testing behaviours, which may result in changes to the number of tests performed each year (e.g., in 2010-11 increased vigilance for lymphogranuloma venereum may have resulted in more diagnoses of this disease, artificially driving up lymphogranuloma rates). Trends are also influenced by temporal changes in testing technologies. Over the past ten years, nucleic acid amplification tests (NAAT) have gradually replaced culture-based diagnostics for chlamydia and gonorrhea testing. The use of a more sensitive test has resulted in increased detection of these infections. NAAT technology has also allowed urine-based screening for chlamydia and gonorrhea, thus reducing the use of urethral swabs for asymptomatic male clients. With the use of this less-invasive procedure, more men may be getting screened for chlamydia and gonorrhea.

- The majority of surveillance data presented in this surveillance report are extracted from case report forms completed by health care providers or public health nurses as part of the case follow-up process (which includes partner notification, patient education, and referral to appropriate services). There is an expected reporting delay to receipt of these forms, which may range from days to months, depending on the infection.

- Cases are classified by exposure category and ethnicity according to information elicited during follow-up from the case or their health care provider, and under-reporting of this information may lead to misclassification. For example, gay, bisexual and other men who have sex with men, and transgender persons may be reluctant to disclose these factors to their health care providers due to social stigma.

- Rates of infectious syphilis diagnoses among First Nations people are calculated with the numerator comprised of individuals with infectious syphilis who self identify as First Nations and the denominator comprised of individuals who are registered First Nations (see Data Sources, below, for further details).

Case Definitions

Sexually transmitted infections (STIs) included in this report are listed as reportable diseases in the *Communicable Disease Regulation* (Schedule A) of the *Public Health Act*.

Chlamydia

Genital: Detection and confirmation of *C. trachomatis* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Extra-genital: Detection and confirmation of *C. trachomatis* in specimens from the conjunctiva, pharynx and other extra-genital sites by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Perinatally-acquired: Detection and confirmation of *C. trachomatis* in nasopharyngeal or other respiratory tract specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen) from an infant who developed pneumonia in the first 6 months of life or conjunctival specimens from an infant who developed conjunctivitis in the first month of life.

Gonorrhea

Genital: Detection and confirmation of *N. gonorrhoeae* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Extra-genital: Detection and confirmation of *N. gonorrhoeae* in specimens from the conjunctiva, pharynx, joint, blood and other extra-genital sites by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Perinatally-acquired: Detection and confirmation of N. gonorrhoeae infection in the first 4 weeks of life leading to the diagnosis of gonococcal conjunctivitis, scalp abscess, vaginitis, bacteremia, arthritis, meningitis or endocarditis, by an appropriate laboratory technique (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Infectious Syphilis

Infectious syphilis is a complex sexually transmitted infection that has a highly variable clinical course. Three stages of syphilis, primary, secondary and early latent, comprise infectious syphilis. Classification by a clinician with expertise in syphilis may take precedence over the following case definitions developed for surveillance purposes.

Primary Syphilis: Current clinical presentation compatible with primary syphilis (e.g., one or more ulcers/chancres), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or
- Reactive serology (treponemal, regardless of non-treponemal serology reactivity) in individuals with no previous history of syphilis, or
- Significant (e.g., four-fold or greater) increase in titre over the last known non-treponemal test.

Secondary Syphilis: Clinical presentation compatible with secondary syphilis (e.g., rash, fever, malaise, lymphadenopathy, mucus lesions, condyloma lata, alopecia, meningitis, headaches, uveitis, retinitis, recent hearing impairment), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark-field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or

- Reactive serology (non-treponemal and treponemal) in individuals with no previous history of syphilis, or
- Significant (e.g., four-fold or greater) increase in titre over the last known non-treponemal test.

Early Latent Syphilis: An individual without symptoms of primary or secondary syphilis and reactive serology (non-treponemal and treponemal) or four-fold increase in titre over the last known non-treponemal test, and one of the following within the previous 12 months:

- Non-reactive serology, or
- Symptoms suggestive of primary or secondary syphilis, or
- Exposure to a sexual partner with primary, secondary or early latent syphilis, or
- Is a member of (or has had sexual partners in the previous 12 months from) groups at known increased risk of syphilis infection in BC, or
- Has a titre of ≥ 1:16.

Early Congenital Syphilis: A stillbirth, neonate or older individual with clinical presentation[14] compatible with congenital syphilis, onset less than two years of age, and one of the following:

- Four-fold higher RPR than maternal titre and positive treponemal confirmatory test, or
- Detection of *T. pallidum* in clinical specimens (e.g., lesions, placenta, umbilical cord, autopsy) through darkfield microscopy, direct fluorescent antibody assay, or PCR, or
- Mother with untreated or inadequately treated syphilis (primary, secondary, early or late latent syphilis) during pregnancy or at birth.

Maternal Syphilis: A woman who meets the case definition of infectious syphilis (primary, secondary, early latent syphilis) or late latent syphilis, and one of the following:

- Syphilis serology conducted as part of prenatal blood screening, or
- Known to have given birth to an infant (live or stillborn) with congenital syphilis, or
- Clinical presentation with infectious syphilis during pregnancy.

Lymphogranuloma Venereum (LGV)

Confirmed: DNA sequencing for *C. trachomatis* confirming serovars of L1, L2, or L3 present.

Probable: One of the following two case definitions:

i) Positive chlamydia NAAT or culture (from any site), and one of the following:
   - Proctitis, or
   - Inguinal/femoral lymphadenopathy, or
   - Suspicious lesion, or
   - Sexual partner who is confirmed or probable LGV case

ii) Clinical symptoms consistent with LGV (proctitis or inguinal/femoral lymphadenopathy or suspicious lesion) without a positive chlamydia test, and sexual partner who is confirmed or probable LGV case.

Data Sources

STI Data
(Chlamydia, Gonorrhea, Infectious Syphilis)

When an individual is diagnosed with a reportable STI, the care provider completes a case report form (Health 208 form) then forwards it to BCCDC where the information is entered into the provincial STI database. Public health clinics with access to the provincial STI database directly enter the information for their newly diagnosed individuals.

Pelvic Inflammatory Disease and Ectopic Pregnancy Data

The diagnoses of pelvic inflammatory disease (PID) and ectopic pregnancy (EP) are captured in the Discharge Abstract Database (DAD) and the Medical Service Plan (MSP) payment database maintained by the BC Ministry of Health. The DAD includes data on patient discharges and day surgeries directly from hospitals in BC, including all known facilities for acute care

and day surgery, and most facilities for chronic care and rehabilitation. The MSP database contains data on insured medical services delivered on a fee-for-service basis. This data includes physician billings for inpatient and outpatient care, claims from supplementary health care practitioners, and claims for laboratory services and diagnostic procedure. MSP data do not include services provided via an Alternate Payment Program (e.g., contract or salary). Approximately 30% of BC physicians receive some remuneration through alternative payments. In particular, physicians in rural areas are more likely to be paid with Alternate Payment Programs. Some hospital emergency departments in BC also are funded through Alternate Payment Program contracts. Administrative data on PID and EP included in this surveillance report are extracted for women of reproductive age (15-44 years) who have at least one physician billing or hospital discharge per year based on the following International Classification of Disease (ICD) codes:

Pelvic Inflammatory Disease

ICD 9: MSP (1992-2010), DAD (1992-2000)
- Salpingitis and oophoritis (614, 614.0-614.2)
- Parametritis and pelvic cellulitis/ peritonitis (614.3-614.5, 614.7)
- Other or unspecified inflammatory disease of female pelvic organs and tissues (614.8, 614.9)
- Inflammatory diseases of uterus except cervix (615, 615.0-615.9)

ICD 10: DAD (2001-2010)
- Salpingitis and oophoritis (N70, N70.0-N70.9)
- Parametritis and pelvic cellulitis/ peritonitis (N73.0-N73.5)
- Other or unspecified female pelvic inflammatory disease (N73.8, N73.9)
- Inflammatory diseases of uterus except cervix (N71, N71.0-N71.9)

Ectopic Pregnancy

ICD 9: MSP (1992-2010), DAD (1992-2000)
- Ectopic pregnancy (633)
- Abdominal pregnancy (633.0)
- Tubal pregnancy (633.1)
- Ovarian pregnancy (633.2)
- Other or unspecified ectopic pregnancy (633.8, 633.9)

ICD 10: DAD (2001-2010)
- Ectopic pregnancy (O00)
- Abdominal pregnancy (O00.0)
- Tubal pregnancy (O00.1)
- Ovarian pregnancy (O00.2)
- Other or unspecified ectopic pregnancy (O00.8, O00.9)

BC Public Health Microbiology Reference Laboratory located at BCCDC

The BC Public Health Microbiology Reference Laboratory (BCPHMRL) performs approximately 15-20% of all gonorrhea testing in the province, receiving specimens predominantly from Provincial Sexually Transmitted Infection Clinic sites at the BC Centre for Disease Control, regional public health, youth, reproductive, and sexual health clinics and hospitals throughout the province. At BCPHMRL, gonorrhea may be detected by nucleic acid amplification testing (NAAT) or conventional culture diagnostic methods. Culture testing is preferentially used for rectal and pharyngeal specimens, and for all specimens from contacts to gonorrhea as well as patients who are symptomatic, not responding to treatment, or presenting for treatment after an initial NAAT-positive test. Antimicrobial susceptibility testing is routinely performed for all *N. gonorrhoeae* isolated by culture from clinical specimens. The BCPHMRL additionally receives gonorrhea isolates forwarded for susceptibility testing from community or hospital-based laboratories in BC. Antimicrobial susceptibility testing is by E-test (bioMerieux), and data are analyzed by isolate.

Population Data

Unless noted otherwise, population data and associated rates are based on the P.E.O.P.L.E. 36 Population Estimates and Projections released by BC Stats, BC Ministry of Labour and Citizens' Services (September 2011).

First Nations Population Estimates

Population rates for First Nations people are calculated using estimates from Aboriginal Affairs and Northern Development Canada (AANDC, formerly INAC: http://www.aadnc-aandc.gc.ca/).

These estimates are based on the Indian Register, which is subject to several limitations, including:

- Under-counting due to delayed reporting of infants entitled to be registered
- Over-counting due to individuals remaining on the Register after they are deceased
- Geographic misclassification because individuals are included in the BC population according to membership of a BC band rather than current place of residence
- Systematic biases from imbalance in the migration into and out of the BC region (these are difficult to quantify)

For further details about the data source and its limitations, see the report entitled *Registered Indian Population by Sex and Residence, 2011*. Aboriginal Affairs and Northern Development Canada.

Live Births

Perinatal rates are calculated using live births data from the BC Vital Statistics Agency (http://www.vs.gov.bc.ca/stats/annual/2010/index.html).

Additional Notes

Classification of Health Region

Cases are assigned to health regions (i.e., Health Authority or Health Service Delivery Area (HSDA)) by residence. If residence is unknown, the case is assigned to the health region where the individual was tested.

Classification of Ethnicity

Infectious syphilis cases are classified by ethnicity according to information elicited from the case or health care provider during follow-up. Since ethnicity data for chlamydia and gonorrhea cases are often not collected, it is not included in this report.

Ethnicity	Example
Aboriginal*	First Nations, Inuit, Métis
Arab/West Asian	Aremnian, Egyptian, Iranian, Moroccan, Lebanese, Afghani
Asian	Chinese, Japanese, Vietnamese, Cambodian, Indonesian, Filipino, Korean, Laotian
Black	African, Haitian, Jamaican, Somali
Caucasian (White)	Irish, Scottish, English, Portuguese, Italian, Russian
Hispanic	Mexican, Central/South American
South Asian	East Indian, Pakistani, Sri Lankan, Punjabi, Bangladeshi
other/mixed ethnicity	ethnicity is known but is not included in one of the above categories or case has dual ethnicity
unspecified	information about ethnicity is not elicited from case or health care provider

* For infectious syphilis, enhanced case report forms have not included response categories for Inuit or Métis. On this basis, some Métis individuals may have been incorrectly described as First Nations in these surveillance data. Revisions to reporting forms are underway to correct this issue.

Exposure Group Hierarchy

Infectious syphilis cases may belong to more than one exposure category. These individuals are assigned to the exposure category listed first (or highest) in the following hierarchy.

1. **MSM***: Male who reports having male sex partner(s), with or without female sex partners.

2. **Street-Involved, Sex Trade Worker and Patron**:

   i) Street-Involved – Person who reports either: (a) living on the street or in a single room occupancy (SRO) hotel; or (b) attached to the street; or (c) having no fixed address; or (d) transient.
   ii) Sex Trade Worker (STW) – Person who reports providing sex to another individual in exchange for money, shelter, food, drugs, etc.
   iii) Patron of STW – Person who reports payment (with money, shelter, food, drugs, etc.) for sex with a STW.

3. **Heterosexual Contact***: Male who reports having female sex partner(s) only, or female who reports having male with/ without female sex partner(s).

4. **Acquired Outside of Canada**:

   i) Foreign Acquired – Person currently residing in Canada but likely acquired syphilis outside of Canada (i.e., reports sexual partner(s) in other countries).
   ii) Immigration – Person immigrating to Canada and identified with syphilis through testing done as part of the immigration process.

5. **Other Risk Factor:** Likely route of exposure is known but cannot be classified into any of the major exposure categories listed here. For example, females reporting female sex partner(s) only.

6. **Unknown:** Route of exposure is unknown or not identified at the time of completion of case follow-up (e.g., route of exposure not provided by case).

* A transgender individual may be assigned to either exposure category depending on how this individual describes their sexual partners.